

POTENTIAL BILLING COMPANIES  
FOR CELLULAR CARRIERS

CAUTION: The billing companies are identified as a point of mailings for roamer tapes, Thus there is the potential that some of the billing companies are only processing the roamer traffic and are not the primary processor of the total customer billing for the cellular carrier.

<u>ASSUMED BILLING VENDOR</u>	<u>CELLULAR CARRIER</u>	<u>NOTES</u>
AUXCO	CONTEL CELLULAR	
	PACTEL MOBILE	
	SO.WESTERN BELL	MIGRATING
	MOBILE SYSTEMS	AUXCO SYSTEM
	BELL SOUTH MOBILITY	
CBSI	B.C. CELLULAR	
	BOSTON CELLULAR	
	UNITED TELESPECTRUM, INC.	
	NORFOLK CELLULAR	
	METRO ONE	
	METROPLEX TELECOMMUNICATIONS	
	METROCELL	
	GREENSBORO CELLULAR	
	DETROIT CELLULAR	
	AUTOMATIC WIDE AREA CELLULAR	
	CENTEL	
	HOUSTON CELLULAR TELEPHONE COMPANY	
	BAY AREA CELLULAR TELEPHONE COMPANY	
	MCCAW COMMUNICATIONS	



POTENTIAL BILLING COMPANIES, PAGE 2

ASSUMED BILLING VENDOR

CELLULAR CARRIER

NOTES

BANK OF ILLINOIS

METRO MOBILE

BUFFALO TELEPHONE

CINN. BELL INFORMATION SYSTEMS

BELL CELLULAR INC.  
(CANADA)

AMERITECH

BELL ATLANTIC ENT. CORP.

UNITED STATES CELLULAR

BELL ATLANTIC

ALTEL MOBILE

NYNEX

CELLTECH

LOUISVILLE CELLULAR TELEPHONE  
COMPANY

YOUNGSTOWN CELLULAR

CAROLINA METRONET

BAYFONE OF TAMPA

COMMONWEALTH COMMUNICATIONS

AKRON CELLULAR TELEPHONE

NORTHERN OHIO CELLULAR

COMMONWEALTH CELLULAR

NEWVECTOR

NEWVECTOR

GENCEL

Copy 1st June  
1872  
1872



POTENTIAL BILLING COMPANIES, PAGE 3

ASSUMED BILLING VENDOR

CELLULAR CARRIER

NOTES

CARRIERS PERFORMING SELF PROCESSING

SOUTHWESTERN BELL MOBILE  
SYSTEMS (MIGRATION AUXCO SYS)

ROCHESTER TELEPHONE

RADIOPHONE

MANUAL BILLING

CYBERTEL

CANTEL

Carl  
Ellen

MISS MARY C. BROWN

May 13, 1986

Mrs. Patricia H. Price  
Manager-New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, Florida 33601

Dear Mrs. Price:

This proposal is presented in response to your request for further information on the prospects of the market for cellular bill processing. Bill processing is used in the generic sense and includes service order, CRIS, number assignment and other related functions rather than applying strictly to "edit-rate-print-mail" bill production. It expands upon our earlier study outline in the letter of February 24, 1986 and develops the basic concepts presented there more fully in light of recent discussions and developments.

#### UNDERSTANDING

INPUT understands that GTEDS wishes to build upon its recently developed base in Mobilnet cellular processing which is moving in-house from an outside source. We further understand that preliminary discussions have been held with a current provider of cellular billing services regarding the possibility of acquiring their processing business and that GTEDS may be interested in acquiring the business of other billing providers. To determine the appropriate level of investment in this form of processing it becomes necessary to understand the market for these services and its segmentation, market growth,



pricing practices and likely future course over the next five years. Additionally it is important to understand the actions of the competitors of which there are at least nine firms. INPUT expects that perhaps four or five of these firms would be directly competitive to GTEDS. To the cellular billing arena GTEDS believes it brings certain powerful advantages. Among these are:

1. Strong knowledge of billing systems.
2. Excellent operational skills.
3. Massive processing capacity in several computing centers.
4. Efficient, low-cost processing ability.

GTEDS personnel find the market attractive because of its apparent congruence with GTED's skills and expected rapid growth.

#### INFORMATION REQUIRED

Based upon discussions, there are three key areas in which further information appears needed to develop an acceptable forecast and participation strategy.

1. Growth of new cellular operators, particularly non-wireline providers, their switch characteristics, "live" dates, financial status and ownership. GTEDS personnel believe that this group has particularly high potential.

Additional thereto, INPUT believes that there may also be significant potential at operating wireline providers due to rumors of dissatisfaction with current billing services.

These two elements should be combined to provide a segmented total forecast of the number of bills to be produced annually for the next three to five years. This may be considered the "gross market potential"



2. The second key area is competitive positioning, strategy and tactics, as well as pricing. With the addition of this data a net market potential may be developed as well as the dollar volume of the market.
3. The third key area is user perceptions, plans and intentions. Conditioned upon this data, it is feasible to develop an available market forecast. Due to the possibility that major celular providers may move billing in-house, it is conceptually possible that the available market may shrink while the market as a whole grows rapidly. It is further possible that new operators may not have volume sufficient to warrant a "mainframe service solution" and will be able to bill adequately with micro or mini-based systems. These operators would also be "unavailable" to GTEDS.

We feel strongly that the market for celular billing services is distinct from the market for cellualr telephone service (although related) and requires a specific and somewhat different approach.

Accordingly, we see the task as divisible into the following parts:

PART 1. - Segment the market by wireline/non-wireline, operating and emerging. Determine from secondary sources supplemented by primary research (if needed) the operational status, size and billing source for the carriers. A further segmentation by market size may be needed, e.g. Top 30, second thirty, etc. Determine the areas of greatest "gross" opportunity.





PART 2. - Determine the pricing policies of the various competitors, principal systems features, hardware type and related data for an agreed set of competitors, most likely IBM-mainframe based, but to include other hardware such as micro's. This activity will have two purposes: 1) the data is directly related to the market sizing exercise and 2) evaluating competitors as potential acquisition candidates. Efforts will also be made to determine clients at this stage although client name data is essentially derived from PART 3.

The prime objective of PARTS 1 & 2 is to understand as fully as possible segmentation and competitors to maximize the outputs of PART 3.

PART 3. - This part requires a telephone survey of cellular operators to determine:

- a. Current processing method.
- b. Service features most used, i.e. S.O.E., on-line account history, trouble reporting, automatic number assignment, etc.
- c. Service features most desired (but not available from current source).
- d. Expected growth in number of bills produced.
- e. Satisfaction with current service; problems if any.
- f. Future bill processing plans including in-house.
- g. Satisfaction with current pricing.
- h. Likelihood of changing billing service in the future, e.g. next year, two years.
- i. Price sensitivity.
- j. Other significant factors to be jointly determined including those which may emerge from PARTS 1 & 2 through analysis.



On the presumption that GTEDS' interest does not extend below the top 90 (ninety) markets and that there is a potential of two carriers per market, we have a universe of 180 respondents. INPUT recommends that a sample be drawn from this group of 60 operators (or potential operators). This will provide 90% confidence in yes/no answers at +/- 6% (approximately), a degree of accuracy sufficient for the present purpose.

We believe the above method will allow GTEDS to make decisions with confidence, compete effectively in the market if warranted and isolate attractive venture partners or acquisition suspects. It will be especially effective in determining objectively the true prospects of the entities in which GTEDS currently has an acquisition interest. Most importantly, it will provide proper forecasts of billing volumes, expenditures, satisfaction levels and related factors which will permit GTEDS to make informed judgements regarding the degree and type of participation warranted by market conditions and cellular operator practices, plans and intentions.

INPUT wishes to note that all items in the memo of May 9 ("Studies") will be covered in this proposed engagement. Additionally INPUT will provide ad hoc consulting based on prior experience in the study of billing systems (and cellular in particular) to assist GTEDS in formulating an effective preliminary strategy during the time this engagement is being executed. An onsite presentation of all study findings, analyses and recommendations will be made.

PROJECT START DATE: May 23, 1986





## SCHEDULE & FEES

INPUT believes it will be able to accomplish Parts 1 & 2 of this engagement (segmentation and basic competitors) within three weeks of receipt of signed authorization. We further believe it is possible to execute PART 3 including questionnaire design, sampling, interviewing and analysis within 7-8 weeks with no allowance made for intervening holidays. The fee for the engagement is \$38,800.00 which is payable in two equal installments of \$19,400, one at the onset of the engagement and the other at its conclusion. Expenses for travel, expedited shipping, documents acquired solely for this engagement and related incidental items will be billed at documentable cost at the conclusion of the engagement. Expenses will not exceed 5% of the engagement fee without the specific permission of the GTEDS project manager. Fees shall be due and payable within thirty (30) days after GTEDS' receipt of INPUT's invoice.

## CONCLUSION

Based on its prior experience in the study of the market for these systems and similar ones, knowledge of the competitors and extensive experience in market assessments, INPUT feels that it is extremely well-qualified to undertake this study for GTEDS. If there are any questions please address them to the undersigned. To give effect to this agreement it is only necessary to sign in the space provided below. Thank you for thinking of INPUT.

Sincerely,

  
D. W. Fostle  
Vice President

Accepted by GTE DATA SERVICES:

Name: DAVID K. DENMARK

Title: PROCUREMENT DIRECTOR

Date: JUN 2 1986

Signature: 

Accepted by INPUT:

Name: D.W. FOSTLE

Title: VICE PRESIDENT

Date: JUNE 14, 1986

Signature: 



## Wireline Operators

Alltel Cellular Communications  
Charlotte, NC

Ameritech Mobile Communications  
Chicago  
Detroit  
Milwaukee  
Cincinnati  
Columbus  
Dayton  
Gary  
Flint

Bell Atlantic Mobile Systems  
Philadelphia  
Washington  
Pittsburgh  
Baltimore  
Allentown  
Wilmington

Bell South Mobility  
Miami  
Atlanta  
New Orleans  
Memphis  
Louisville  
Birmingham  
Nashville  
Jacksonville  
Orlando  
W. Palm Beach  
Baton Rouge  
Chattanooga

Centel Cellular Company  
Greensboro  
Omaha

Commonwealth Cellular  
North East Pennsylvania

Contel Cellular  
Norfolk  
Richmond  
Fresno  
El Paso  
Mobile





## Wireline Operators

## GTE Mobilnet

San Francisco  
Houston  
Cleveland  
Tampa  
San Jose  
Indianapolis  
Portland  
Honolulu  
Akron  
Grand Rapids  
Greenville  
Austin  
Lansing  
Canton

## New Vector Communications

Minneapolis  
Denver  
Seattle  
Phoenix  
Salt Lake City  
Tucson  
Tacoma  
Albuquerque  
Colorado Springs  
Portland

## Nynex Mobile

New York  
Boston  
Buffalo  
Providence  
Albany  
Syracuse  
Worcester  
New Brunswick  
Springfield  
Long Branch  
New Bedford

## Pac Tel Mobile Access

Los Angeles  
San Diego  
Sacramento  
Oxnard

Rochester Telephone Mobile Cms.  
Rochester

## Southern New England Telephone

Hartford  
Bridgeport  
New Haven



## Wireline Operators

## Southwestern Bell Mobile Systems

Dallas  
St. Louis  
Kansas City  
San Antonio  
Oklahoma City  
Wichita

## United States Cellular

Tulsa  
Knoxville

## United Tele Spectrum

Toledo  
Youngstown  
Raleigh - Durham  
Harrisburg  
Johnson City  
Charleston  
Orlando  
Tri cities  
Northwest



# CELLULAR RADIO SUMMARY STATISTICS

	<u>1/85</u>	<u>1/86</u>	<u>% CHG.</u>
SUBSCRIBERS	98,000	320,000	226.5
REVENUE	\$ 178,000,000	\$300,000,000	71.9
CAPITAL INVESTED	\$ 354,761,000	\$911,167,000	156.8
SITES	346	913	163.9
SYSTEMS OPERATING	33	102	209.1

INPUT

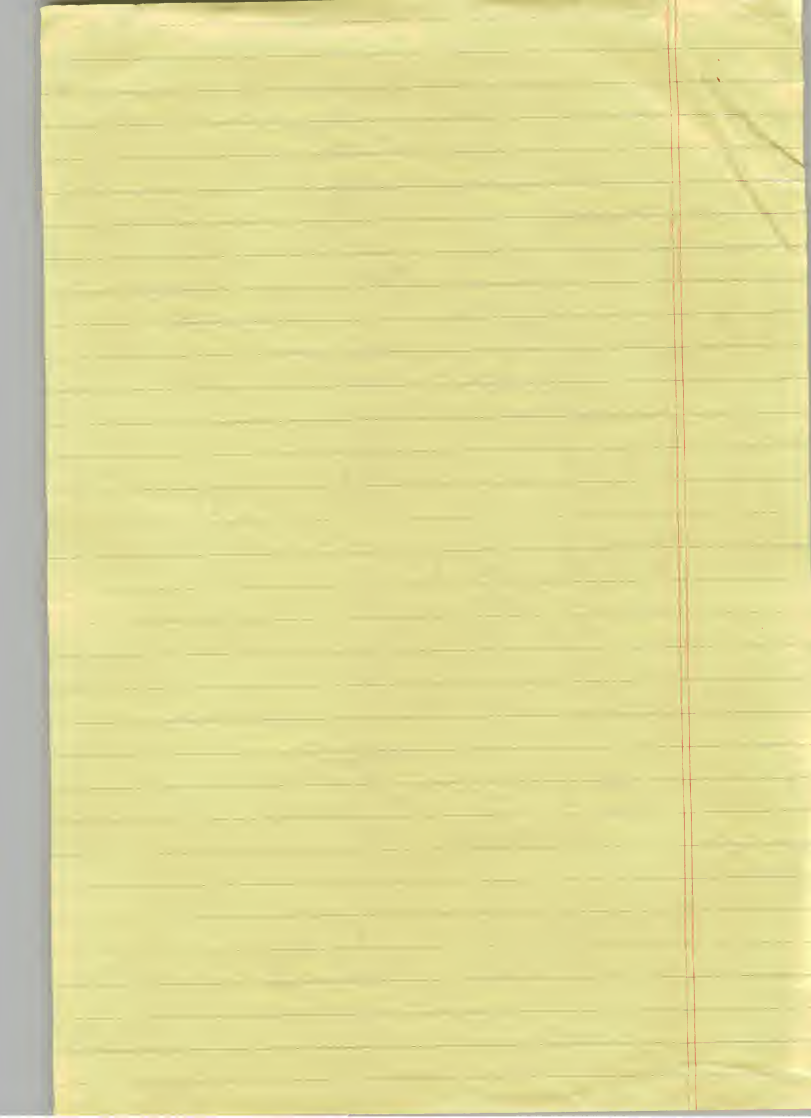


now	87	89	87	
100	80	150	180	250
1000	125		2250	
300	333		2794	
3000	27		3810	
4500	100%	500	9000	27,000
400	25%	50%	300	600
1500	66%		2490	
2550	60%	100%	4080	5100
700	50		1050	
600	150		1500	
1000	300		4000	
300	400	1000	1500	3300
500	200	600	1500	3500
4000	100	400	8000	20,000
1000	40	25	1400	1750
15000	50	160	22,500	37,500
10,000	33%		13,300	
46,450			79,859	

$86/89$   
 $27,950 \leftarrow$   
 $49.77\% \text{ MGR}$

$71.92\%$   
 $\rightarrow 93,900$

531-6826







Y611

GTE Data Services Incorporated  
First Florida Tower  
P. O. Box 1548  
Tampa, Florida 33601  
813 224-3131

June 5, 1986

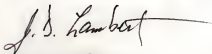
Mr. D.W. Fostle  
Vice President  
INPUT  
Parsippany Place Corporate Center  
Suite 201  
959 Route 46 East  
Parsippany, New Jersey 07054

Dear Don:

Attached please find the following information concerning the cellular study:

1. Features and Benefits items that we would like to be addressed in the customer call survey.
2. Potential Billing Companies for Cellular Carriers.
3. June copy of "Cellular Business" status report.
4. List of attendees at June 2-4, 1986, CTIA convention.
5. Copy of program speakers on presentation at CTIA of "Cellular Tealeaves: What's in the Forecast".

Hope this will be helpful,

  
J.D. Lambert  
TIBS-Cellular Business



INPUT STUDY  
FEATURES AND BENEFITS

- A. More localized processing, (Regional GTEDS data centers vs one data center of existing processing companies).
- B. Wireline vs Non wireline, (prospective of wireline/non wireline carrier being processed by a predominantly wireline/non wireline processing company). Question of perceived data base security by processing company.
- C. Importance of processing backup and disaster recovery programs. How do they perceive their current supplier's capabilities to recover, or minimize on line interruptions.
- D. What is perception of network cost and service impact of sending and retrieving information with their current vendor?
- E. What is the perception of network backup vs cost. Do they have network backup?
- F. Does the customer's operation utilize centralized concepts in switch monitoring and management, Administration and maintenance. ( remote order entry, bill inquiry etc)? If not, are they interested?
- G. Is automatic interface between the centralized switch control system and the billing and support system perceived as of value?

H. Clearing House:

Value to company of one contract with cleaning house vs roaming agreements with all other companies. Value of clearing house assuming account payable and receivables responsibilities vs preparing account statements of payable and receivables but the individual companies being responsible for payment and collections.

Price per message that they would pay?

- I. Perceptions of contact to mainframe vs microbased systems? Less flexibility at a lower cost. What are they not willing to give up for the lower cost system.
- J. Remote order entry and service activation via agents, and/or resellers.
- K. Feature that allows mass input and updates for credits to customer accounts.

WILLIAMSON & CO.

1117 1/2

1117 1/2



**'86 CELLULAR  
SUPER YEAR**

## **Attendance Book**

**2nd ANNUAL CONVENTION  
June 2-4, 1986  
Washington, D.C.**



**Attendance Roster**  
(As of May 21, 1986)

**Advanced Cellular Technologies (ACT)**  
Jerrold I. Chervitz

**ALLTEL Mobile Communications**  
Donald E. Steely

**American Cellular Telephone Corporation**  
James A. Dwyer

**Ameritech Mobile Communications, Inc.**  
Allan J. Arlow  
Dennis F. Strigl  
Thomas M. Talty

**Ameritech Services**  
Dale Jensen

**AMTELCO**  
Christina Collins

**Arthur Andersen & Co.**  
Donald C. Moore

**Associated Communications Corporation**  
Myles Preston Berkman

**ASTRONET Corporation**  
Charles R. Atwater  
William M. Fincher  
Brian Osmun  
Amy R. Rosenbloom  
Jim Tyson  
William W. Woodruff

**AT&T**  
Joy Remmer

**AT&T Bell Laboratories**  
Duane L. Huff  
T. K. Wingard

**AT&T Communications**  
Carole J. Breckinridge  
Stacy Levy

**AT&T Consumer Products**  
Kenneth L. Wilson

**AT&T Network Systems**  
Richard A. Dexter  
Cynthia L. Zey





**Bay Area Cellular Telephone - San Francisco**  
Jim M. Dixon

**Bell Atlantic**  
Richard J. Fry  
John P. Kirwan  
Mary R. McElhone

**Bell Atlantic, NSI**  
Glenn C. Grayburn  
Norris N. Shelton

**Bell Atlantic Enterprises Corporation**  
Robert E. Beran  
Michael J. Doyle  
Ronald A. Johnson  
Howard Pagel  
Donald T. Winski

**Bell Atlantic Mobile Systems, Inc.**  
Emil J. Beran  
John W. Berresford  
Richard J. Lyons  
Edward F. Weingart

**Bell Cellular Inc.**  
Judi Wootton

**Bell Communications Research**  
Richard Kilcomons  
Doug Olson

**Bell of Pennsylvania**  
Frank Wurtz

**Business Communication Review**  
Stuart Crump, Jr.

**BellSouth Corporation**  
Richard H. Hohn

**BellSouth Mobility Inc**  
T. L. Adams  
Jo Ann S. Blount  
John W. Cossart  
Wayne R. DuBois  
Roy Ethridge  
James C. Hobbs  
Gaylord B. Myers  
Daniel P. Norman  
Reid Ann Stephens  
James A. Thorpe  
Robert L. Tonsfeldt

**Blooston & Mordkofsky**  
Arthur Blooston

**Bluegrass Broadcasting Company, Inc.**  
Ralph E. Hacker

**Burr, Egan, Deleage & Co., Inc.**  
Brion B. Applegate

**Business Communication Review**  
Stuart Crump, Jr.

**CAWC Inc.**  
Barry Goodwin  
Michael Silberstein

**CTI Inc.**  
Jimmy M. Tucker

**CTIA**  
Robert W. Maher  
Peggy M. Marilley  
Elizabeth F. Maxfield  
Patricia A. Rice  
Lynne Rose  
Sharon L. Taylor

**C-TEC**  
Timothy D. Carroll

**Department of California Highway Patrol**  
Harry T. Adair

**Cantel Inc.**  
Joe G. Church  
Lenny Katz

**Cardiff Publishing**  
Catherine Chalmers

**CellSouth Partners**  
John Metelski

**Cellular America, Inc.**  
Justin Kolb

**Cellular Business Magazine**  
Thomas C. DeCoursey  
Kenda Richardson  
Rhonda L. Wickham

**Cellular Business Systems, Inc.**  
Mark J. Nielsen

**Cellular Directions, Inc.**  
Martin J. Gauthier

**Cellular, Inc.**  
Michael Fluharty



**Cellular Marketing Magazine**

Judy L. Rudrud

**Cellular One - Boston**

Robert Sullivan

Paul J. Tobin

**Cellular One -**

**Milwaukee Telephone Company**

Michael J. Flanigan

**Cellular One - Ohio**

Karl S. Brooks

**Cellular One - Washington/Baltimore**

Gary Brunt

Kathryn Condello

Cynthia DeGeorge

Arthur S. Lane

Emily Nelms

**Cellular One - West Palm Beach**

Gerald Leary

**Cellular Radio Corporation**

Andrew H. Lamothe

**Celwave R.F., Inc.**

Oscar Harris

**Centel Cellular Company**

Charles F. Wright

**Century Telephone Enterprises, Inc.**

Dick Barnaby

C. Kenneth Conrad

Tony R. Davis

Dave Farrell

Bob Frame

David E. Hogan

Clarke M. Williams, Jr.

**Cincinnati Bell Information Systems**

Deborah A. Disch

**Commonwealth Mobile Services**

Paul W. Mazza

**Commonwealth Telephone Enterprises**

Margaret Simok

**Communications Daily**

Arthur Brodsky

**Communications Magazine**

George Dennis

Robert C. Stoddard

**Communications Week**

Steven Titch

**Contel Cellular Inc.**

Tim Burningham

Paul G. Kozlowski

James F. Potter

**Continental Cellular Corp.**

Thomas P. Willett

**DeRand Investment Corporation**

B. Eric Sivertsen

**Donaldson, Lufkin & Jenrette**

**Securities Corp.**

Dennis H. Leibowitz

**Edwards & Angell**

Stephen O. Meredith

George Michaels

**Ericsson Radio Systems**

Manfred Buchmayer

Hans Lindqvist

Mats Ljunggren

Lisa Pelenski

David Pepe

Joseph Tokarz

Don Vaughn

**Ernst & Whinney**

Brian Kirkpatrick

**F.C.J., Inc.**

Charlie Jones

Malinda Wentworth

**Federal Communications Commission**

Susan L. O'Connell

**First Cellular**

C. J. Lloyd

**Fujitsu America, Inc.**

J. Dodo

Mark Lopez

C. P. Shankar

**Gabelli & Company, Inc.**

Mario J. Gabelli

**General Electric Company**

William Bennett

John Lippard

L. C. Watkins



**Graphic Scanning Corp.**

Richard J. Sherwin  
William S. Wheatley

**GTE Mobilnet Incorporated**

Randall L. Crouse  
Phil L. Forbes  
Cynthia Hadley  
James C. Harpham  
Dale L. Nicholson

**Gurman, Kurtis & Blask, Chartered**

Jerome K. Blask, Esquire

**Hennessey, Stambler & Siebert, P. C.**

Richard C. Rowleson, Esquire

**Horizon Towerz, Inc.**

Robert W. Hale

**Houston Cellular Telephone Company**

Richard W. Wirth

**Illinois Bell**

Daniel J. Kocher

**Illinois Commerce Commission**

Michael Moos

**Indiana Bell Telephone Co., Inc.**

David E. Hampton  
Robert D. Walters II

**Irving Trust Co.**

Eileen S. Kulp

**E. F. Johnson Company**

Ralph W. May

**Jubon Engineering**

Jan David Jubon

**Kadison, Pfaelzer, Woodard, Quinn & Rossi**

Carl W. Northrop, Esquire

**LeBoeuf, Lamb, Leiby & MacRae**

Daniel P. Duthie

**Arthur D. Little, Inc.**

Clifford A. Bean

**MCI Airsignal, Inc.**

Peter P. Conti  
Diana Francis

**MetroCel Cellular Telephone Co.**

Charles Daniel Yost

**Metromedia, Inc.**

Gene Belardi

**Metro Mobile CTS, Inc.**

Aldo A. Bottani

**MidAmerica Cellular, Inc.**

John H. Newcomb

**Millicom Incorporated**

James J. Healy

**Mobile Communications Corporation of America**

C. Claiborne Barksdale  
Jai P. Bhagat  
John N. Palmer

**Motorola Cellular Service, Inc.**

Michael R. Marrs  
Suzette Steiger

**Motorola Inc.**

Michael Bernique  
Richard Braz  
James P. Caille  
Kevin Colosia  
Robert J. O'Donnell

**Mountain Bell**

Steven Kidd

**McDonnell Douglas Communication Industry Systems Co.**

Robert J. Donze

**Robert R. Nathan Associates, Inc.**

Anne Pickford Cahill  
John Casey

**National Emergency Number Association (NENA)**

Michael Moos

**NEC America, Inc.**

Robert Humphries  
Joe Dillbeck

**NewVector Communications, Inc.**

John E. DeFeo

**Nokia - Kinex**

Phillip Lisk  
K. P. Wilska

**North-West Cellular, Inc.**

Patrick Connor

**Northern Telecom**

Larry Behmer  
Nick Funston  
Leonard McCoy  
Becky Roy-Ash



**NYNEX Service Company**

John J. Condon  
Robert J. Welsh

**NYNEX Mobile Communications Company**

Christine A. Dawson  
Gordon S. Fraser  
David E. Mahan  
Christopher J. Mahoney  
Charles J. Many  
James O'Neill

**OKI Telecom**

Mal Gurian  
Richard Hoff  
Donald Magrini  
William L. Quirk  
Anthony Russo

**PacTel Mobile Access**

H. Trevor Jones  
Richard Nelson

**PacTel Mobile Companies**

Hank M. Hickey  
Philip J. Quigley  
Reed Royalty

**The Partridge Group**

B. Waring Partridge

**Personal Communications Technology**

Debra Baker  
Benn Kobb  
Don Moore

**Phillips, Nizer, Benjamin, Krim & Ballon**

Monte Engler

**Pierson, Ball & Dowd**

The Honorable Dean Burch

**Quintron Corporation**

Clark Emerick  
Glen Teason

**RCR Publications, Inc.**

Jeff Silva

**Reinheimer Nordberg Inc.**

Howard E. Reinheimer, Jr.

**Rochester Telephone Corporation**

James E. Whelehan

**St. Petersburg Police Department**

Sgt. Maurice McGough

**Schnader, Harrison, Segal & Lewis**  
Linda Wellstein, Esquire

**Seacoast Cellular Inc.**

Eric B. Hertz

**Solomon - Wolff Associates**

Joey Wolff

**SONECOR Company**

A. Thomas Kelly

**Southwestern Bell Mobile Systems**

John T. Stupka

**Southern Bell Telephone**

Edward L. Winfield  
Harry E. Young

**Spectrum Planning, Inc.**

Nicholas C. Stanley

**Subcarrier Communications**

Alan A. Reiter

**United States Cellular**

William S. Arnett  
Joyce Gab  
Richard Goehring  
H. Donald Nelson  
William J. Stears

**U. S. Department of Commerce**

Gossack Bawer

**United TeleSpectrum, Inc.**

Robert H. Baranek  
Martha Gershun  
Robert J. Marino

**Vanguard Cellular Systems, Inc.**

Haynes Griffin

**WTC Information Services**

William Church

**Walker Telecommunications Corp.**

**Mobile Communications Division**

Robert G. Scheid

**Westoaks Investments**

Kevin Cox

**Wilkinson, Barker, Knauer, Quinn**

Michael Deuel Sullivan

**Chris Witze & Associates, Inc.**

Chris Witze

**Wilmer, Cutler & Pickering**

William R. Richardson, Jr.



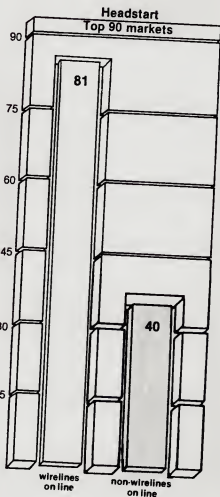
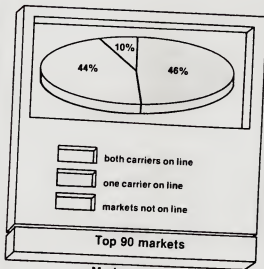




# STATUS REPORT

Key: W—wireline carrier. NW—non-wireline carrier. CPG—construction permit granted. Information available as of April 25, 1986.

MSA #/Name	System Operators	Status	# Cells	Switching Equipment
1 NEW YORK	W—Bell Mobile NW—Bell Mobile	On line 6/15/84 On line 4/5/85	1	
2 LOS ANGELES	W—Pacific Telephone NW—LA Cellular Telephone	On line 6/15/84 CPG 12/4/84	24	Ericsson
3 CHICAGO	W—American Mobile NW—Cellular One	On line 10/13/83 On line 9/1/85	1	
4 PHILADELPHIA	W—Bell Atlantic Mobile NW—Metropolitan	On line 7/12/84 On line 2/12/85	1	
5 DETROIT	W—Ameritech Mobile NW—Cellular One	On line 9/21/84 On line 7/30/85	1	
6 BOSTON	W—Nynex Mobile NW—Cellular One	On line 1/1/85 On line 1/1/85	1	
7 SAN FRANCISCO	W—GTE Mobilnet NW—Cellular One	On line 4/2/85 CPG 8/9/84	27	Ericsson
8 WASHINGTON	W—Bell Atlantic Mobile NW—Cellular One	On line 4/2/84 On line 12/1/85	1	
9 DALLAS	W—Southwestern Bell Mobile NW—Metropolitan	On line 7/31/84 On line 3/1/85	1	
10 HOUSTON	W—GTE Mobilnet NW—Houston Cellular Telephone	On line 8/8/84 CPG 12/27/84	29	Ericsson
11 ST LOUIS	W—Southwestern Bell Mobile NW—C/S Bell	On line 7/15/84 On line 7/18/84	1	
12 MIAMI	W—BellSouth Mobile NW—Florida Cellular Telephone	On line 5/25/84 CPG 4/26/85	18	NTT
13 PITTSBURGH	W—Bell Atlantic Mobile NW—Cellular One	On line 12/16/84 CPG 3/6/84	17	Astronet
14 BALTIMORE	W—Bell Atlantic Mobile NW—Cellular One	On line 4/2/84 On line 12/16/84	1	
15 MINNEAPOLIS	W—NewVector Communications NW—Cellular One	On line 6/6/84 On line 7/23/84	1	
16 CLEVELAND	W—GTE Mobilnet NW—Cellular One	On line 12/18/84 On line 5/31/85	1	
17 ATLANTA	W—BellSouth Mobile NW—GenCom Cellular of Atlanta	On line 8/8/84 CPG 1/18/85	10	Motorola (I)
18 SAN DIEGO	W—Pacific Telephone NW—GenCom	On line 8/15/85 CPG 3/7/85	1	Motorola
19 DENVER	W—NewVector Communications NW—Cellular One	On line 7/19/84 CPG 1/31/85	11	NEC (I)
20 SEATTLE	W—NewVector Communications NW—Cellular One	On line 7/12/84 On line 12/12/85	1	
21 MILWAUKEE	W—Ameritech Mobile NW—Milwaukee Telephone Co.	On line 8/1/84 On line 8/1/84	1	
22 TAMPA	W—GTE Mobilnet NW—Bayfone	On line 11/30/84 CPG 4/28/85	10	
23 CINCINNATI	W—Ameritech Mobile NW—Southern Ohio Telephone	On line 11/5/84 CPG 1/9/85	13	Ericsson
24 KANSAS CITY	W—Southwestern Bell Mobile NW—Cellular One	On line 5/14/84 On line 2/14/86	13	Motorola
25 BUFFALO	W—Nynex Mobile NW—Buffalo Telephone	On line 4/16/84 On line 6/1/84	7	Motorola
26 PHOENIX	W—NewVector Communications NW—Metro Mobile CTS	On line 8/15/84 On line 3/1/85	9	NTT
27 SAN JOSE	W—GTE Mobilnet NW—Cellular One	On line 4/2/85 CPG 8/9/84	27	Ericsson
28 INDIANAPOLIS	W—GTE Mobilnet NW—Indianapolis Telephone Co.	On line 5/3/84 On line 2/3/84	5	Motorola
29 NEW ORLEANS	W—BellSouth Mobile NW—Radiofone	On line 8/1/84 On line 8/6/85	5	Motorola
30 PORTLAND OR	W—GTE Mobilnet NW—Cellular One	On line 3/5/85 On line 7/12/85	5	Motorola



— Includes Washington, DC, and Baltimore.  
— Includes Seattle and Tacoma, WA.  
— Includes San Francisco and San Jose, CA.

— Includes Philadelphia, Allentown, PA, and Wilmington, DE.  
— Includes Miami and Ft. Palm Beach, FL.

I—Indicated in filing but no contract.



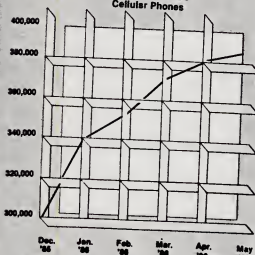
## The Procurement Stakes

Top 90 markets		
Manufacturer	Systems contracted for	Systems on line
Motorola	63	48
AT&T	51	44
NTTICE	20	18
Ericsson	16	5
NEC	4	3
Astronet	3	2
CTIEF, Johnson	1	1

## New Markets

93	LAS VEGAS, NV
W - Centel State - On line 2/2/85 # of Cells: 5 Switching Equipment: Motorola	
NW - AMCELL	

## Installed Base Cellular Phones



The information for the graph above is extrapolated from industry sources.

The material for this listing has been collected from the FCC and system operators. If you have new or additional information not yet listed here, please call Kenda Richardson, associate editor, at 913-888-4664.

MSA #/Name	System Operators	Status	# Cells	Switching Equipment
31 COLUMBUS OH	W - Ameritech Mobile NW - Cellular One	On line 5/30/85 CPG 1/26/85	5	NTTICE Ericsson
32 HARTFORD CT	W - Southern New England Tel NW - Hartford Cellular Co.	On line 1/13/85 CPG 2/14/85	6	AT&T Motorola
33 SAN ANTONIO TX	W - Southwestern Bell Mobile NW - Cellular One	On line 1/28/85 CPG 1/30/85	12	AT&T
34 ROCHESTER NY	W - Rochester Telephone NW - Genesee Telephone Co.	On line 6/14/85 CPG 1/30/85	5	AT&T Ericsson
35 SACRAMENTO CA	W - PacTel Mobile Access NW - Sacramento Cellular Tel.	On line 6/23/85 CPG 2/13/85	5	NEC
36 MEMPHIS TN	W - BellSouth Mobility NW - Memphis Cellular Tel.	On line 5/18/85 CPG 2/13/85	5	Motorola AT&T
37 LOUISVILLE KY	W - BellSouth Mobility NW - Louisville Telephone	On line 1/3/85 On line 2/15/86	6	Motorola AT&T
38 PROVIDENCE RI	W - Nynex Mobile NW - Providence Cellular Tel.	On line 8/22/85 CPG 2/1/84	4	AT&T Motorola
39 SALT LAKE CITY UT	W - New Venture Communications NW - Salt Lake City Telephone	On line 1/29/85 CPG 3/6/85	6	AT&T
40 DAYTON OH	W - Ameritech Mobile NW - Cellular One	On line 5/31/85 CPG 2/27/85	5	NTTICE Ericsson
41 BIRMINGHAM AL	W - BellSouth Mobility NW - Birmingham Cellular Tel.	On line 9/26/85 CPG 2/14/85	3	Motorola
42 BRIDGEPORT CT	W - Southern New England Tel NW - Bridgeport Cellular Co.	On line 5/20/85 CPG 1/28/85	5	AT&T Motorola
43 NORFOLK VA	W - Centel Cellular, Inc NW - Cellular One	On line 5/3/85 On line 11/1/85	4	AT&T Motorola
44 ALBANY NY	W - Nynex Mobile NW - Cellular System One	On line 6/25/85 CPG 9/4/84	4	NTTICE
45 OKLAHOMA CITY OK	W - Southwestern Bell Mobile NW - Cellular One	On line 1/14/85 On line 1/17/86	9	AT&T AT&T
46 NASHVILLE TN	W - BellSouth Mobility NW - Nashville Cellular Telephone	On line 6/10/85 CPG 1/30/85	8	Motorola
47 GREENSBORO NC	W - Centel NW - Cellular One	On line 5/15/85 On line 12/27/85	8	Motorola
48 TOLEDO OH	W - United TeleSpectrum NW - Toledo Cellular Telephone	On line 7/25/85 On line 4/15/86	9	Motorola Ericsson
49 NEW HAVEN CT	W - Southern New England Tel. NW - New Haven Cellular Co.	On line 3/14/85 CPG 2/14/85	6	AT&T Motorola
50 HONOLULU HI	W - GTE Mobiline NW - Honolulu Cellular Tel.	CPG 3/26/84 CPG 2/27/85	4	Motorola Ericsson
51 JACKSONVILLE FL	W - BellSouth Mobility NW - Jacksonville Cellular Tel.	On line 9/12/85 CPG 2/21/85	6	Motorola
52 AKRON OH	W - GTE Mobiline NW - Cellular One	On line 10/31/85 CPG 2/13/85	4	Motorola NTTICE
53 SYRACUSE NY	W - Nynex Mobile NW - Cellular One	On line 1/24/86 On line 12/31/85	3	NTTICE Motorola
54 GARY IN	W - Ameritech Mobile NW - Gary Cellular Telephone	On line 3/11/85 CPG 1/30/85	3	AT&T Ericsson
55 WORCESTER MA	W - Nynex Mobile NW - Worcester Cellular Tel.	On line 11/18/85 On line 11/18/85	5	AT&T
56 NORTHEAST PENNSYLVANIA	W - Commonwealth Telephone NW - Northeast Pennsylvania Tel.	On line 7/2/85 On line 1/17/86	8	NTTICE NTTICE
57 TULSA OK	W - United States Cellular NW - Tulsa Cellular Telephone Co	On line 8/30/85 On line 3/21/86	8	NEC Astronet
58 ALLENTOWN PA	W - Bell Atlantic Mobile NW - Cellular One	On line 3/18/85 On line 10/18/85	32*	AT&T NTTICE
59 RICHMOND VA	W - Centel Cellular, Inc. NW - Cellular One	On line 5/10/85 CPG 2/4/85	5	AT&T NEC
60 ORLANDO FL	W - BellSouth Mobility NW - Orlando Cellular Tel.	On line 2/27/85 CPG 2/27/85	4	Motorola

\* - Includes Philadelphia, Allentown, PA, and Wilmington, DE.



# STATUS REPORT



SMSC #/Name	System Operators	Status	# Cells	Switching Equipment
61	W - Alnet NW - Metro Mobile	On line 4/15/85 On line 3/1/85	6	Motorola Motorola
62	W - Nynex Mobile NW - New Brunswick Cellular Tel.	CPG 9/26/84 CPG 2/7/85	3	AT&T Motorola
63	W - Nynex Mobile NW - Springfield Cellular Tel.	CPG 4/19/84 CPG 1/30/85	4	AT&T Motorola
64	W - GTE Mobinet NW - Grand Rapids Cellular Tel.	CPG 10/17/84 CPG 1/30/85	5	AT&T Ericsson
65	W - Centel NW - Omaha Cellular Telephone	On line 4/15/85 On line 12/23/85	4	Motorola CTIEFJ
66	W - United TeleSpectrum NW - Youngstown Cellular Tel.	On line 9/19/85 On line 12/23/85	2	Motorola Astronet
67	W - GTE Mobinet NW - Metro Mobile	CPG 11/1/84 CPG 2/21/85	4	Motorola Motorola
68	W - Ameritech Mobile NW - Flint Cellular Telephone	On line 7/12/85 On line 7/30/85	2	AT&T Ericsson
69	W - Bell Atlantic Mobile NW - Wilmington Cellular Tel.	On line 3/27/85 CPG 1/30/85	32*	AT&T Motorola
70	W - Nynex Mobile NW - Long Branch Cellular Tel.	CPG 9/26/84 CPG 1/30/85	3	AT&T Motorola
71	W - United TeleSpectrum NW - Cellular One	On line 11/11/85 On line 9/16/85	10 9	Motorola NTTGE
72	W - Bell South Mobility NW - W. Palm Beach Cellular Tel.	On line 5/23/85 CPG 2/19/85	23*	AT&T
73	W - Bell South Mobility NW - Oxnard Cellular Telephone	On line 10/30/85 CPG 2/14/85	3	AT&T
74	W - Centel Cellular, Inc. NW - Fresno Cellular Telephone	CPG 10/22/84 CPG 2/26/85	3	AT&T
75	W - GTE Mobinet NW - Cellular One	On line 9/27/85 On line 12/27/85	5 6	Motorola AT&T
76	W - Nynex Mobile NW - New Bedford Cellular Tel.	On line 12/9/85 CPG 2/13/85	2	AT&T Motorola
77	W - NewVector Communications NW - Metro Mobile	On line 8/6/85 On line 4/1/86	3 4	NTTGE Motorola
78	W - GTE Mobinet NW - Lansing Cellular Tel.	CPG 10/9/84 CPG 2/21/85	2 8	AT&T Ericsson
79	W - United States Cellular NW - Knoxville Cellular Telephone	On line 7/23/85 CPG 2/7/85	7	NEC
80	W - BellSouth Mobility NW - Baton Rouge Cellular Tel.	On line 7/2/85 CPG 1/30/85	3	Motorola
81	W - Centel Cellular, Inc. NW - Metro Mobile	On line 2/25/85 CPG 1/28/85	2 4	AT&T Motorola
82	W - NewVector Communications NW - Cellular One	On line 4/18/85 On line 12/12/85	3 17*	NTTGE AT&T
83	W - Centel Cellular, Inc. NW - Bay Area Telephone Co.	On line 9/3/85 CPG 1/30/85	6	AT&T
84	W - GTE TeleSpectrum NW - Harrisburg Cellular Tel.	On line 10/16/85 On line 9/18/85	4	Motorola NTTGE
85	W - TeleSpectrum NW - Cellular One	On line 10/3/85 CPG 2/1/85	6	Motorola
86	W - NewVector Communications NW - Metro Mobile	On line 8/13/85 On line 11/1/85	2 3	NTTGE Motorola
87	W - GTE Mobinet NW - Canton Cellular Telephone	CPG 10/17/84 CPG 1/30/85	2	Motorola NTTGE
88	W - Bell South Mobility NW - Chattanooga Cellular Tel.	On line 8/1/85 CPG 2/1/85	4	Motorola
89	W - Bell South Mobility NW - Wichita Cellular Tel.	On line 2/11/85 On line 1/24/86	4 2	Motorola AT&T
90	W - Charleston Cellular Tel.	On line 9/11/85 CPG 1/28/85	5	Motorola Motorola

\* Includes Seattle and Tacoma, WA.  
\* Includes Philadelphia, Allentown, PA, and Wilmington, DE.  
\* Includes Miami and W. Palm Beach, FL.

Continued from page 28.

quiring analysis by engineering personnel intimately knowledgeable with not only the features and functions of the equipment, but also the equipment engineering design and components.

## The decision

At the beginning of the article, we emphasized that all too often the operator's maintenance concerns revolve around the hub and not the spokes of the wheel. It was not our intent to minimize the importance of the switch, but to highlight an area which should be of significant importance to cellular system operators. It is unfortunately an area that receives too little attention too late. Also, it was not our intent to provide a cellular system operator with all of the answers to his cell site maintenance questions; it was our goal to provide a framework from which the right questions could be asked.

No cellular system operator should be reluctant to request extensive information regarding maintenance support from cellular system equipment manufacturers and potential third party service providers. The level of emphasis placed on maintenance by manufacturers varies considerably and the operator must be cognizant of subtleties in the manufacturers' approach to meeting the operators' needs today, and in the future. The analysis of third party service providers should be even more rigorous than that of the equipment manufacturers. Some, or all, of the non-quantifiable benefits of contracted service may be missing from the third party's resource and skill base.

Remedial and preventive maintenance are unavoidable tasks. It is incumbent upon the cellular system operator to make the right decisions during the planning process. The relative effect of the factors of the equation are up to you. Cell site maintenance doesn't cost, it pays.

Korbeck and Mayer are Cellular Implementation Managers in Motorola's National Service organization, Schaumburg, IL.



✓ **Cellular Tealeaves: What's in the Forecast?**

Market analysts will turn their attention to a review of industry performance and to estimates of what lies ahead as the industry matures. This discussion will provide insight into conventional wisdom on market potential, and observations on developments which will affect cellular markets, including judicial, regulatory and Congressional actions.

**Moderator:**

The Honorable Dean Burch  
Partner  
Pierson, Ball and Dowd

**Panelists:**

William Church  
WTC Information Service

Clifford A. Bean  
Telecommunications Marketing Manager  
Arthur D. Little, Inc.

Dennis H. Leibowitz  
Vice President  
Donaldson, Lufkin & Jenrette  
Securities Corp.

S. J. (Joey) Wolff  
Managing Director  
Solomon-Wolff Associates, Inc.





SUBJECT: INPUT STUDIES

DATE: May 9, 1986

I. JOINT VENTURE/ACQUISITION CANDIDATES

CBSI - CELLULAR BUSINESS SYSTEM

- A. Current Financial Situation
- B. Customer Base
- C. Customer Perception of Service
- D. Customer Perspective of Systems to Meet Needs
- E. Cost of Service

II. AUXCO

- A. Customer Base
- B. Cost
- C. Customer Perception of AUXCO Service
- D. Customer Perception of AUXCO System

III. CELLULAR MARKETING

A. Bell Atlantic Enterprises Inc. & New Vector - Processing Services Analysis

*N.S. WESS*

*↳ Competitive*

- 1. Features comparative to other (?)  
Systems - Customer Perception
- 2. Cost
- 3. Service

B. Non-Wire Lines

- a. Status of on-line plans
- b. Timing
- c. Billing and Services Provides - Contracted Length
- d. Cost
- e. Service Satisfaction
- f. Switching Equipment Utilized
- g. Do they have centralized monitoring and maintenance including recent change update?
- h. Service orders automated? How?  
PC, Back, on-line
- i. Financial Stability of Operation
- j. Owners/Partners - identify % of any wireline holdings



CO #	COMPANIES	#13 AND PHONE	#14 DIRL PHONE	#15 VOICE MAIL	#16 TXVVO TRANS	#17 FAX DATA	#18 FAX INPUT	#19 FAX GRAPH	#20 FAX PRINT	#21 DE ACCESS	#22 PERIN LANG
1	1 BTG - SECURITY DEPT (telecommunications)										
2	2 BTG A - INFORMATION COMMUNICATIONS CENTER video productions										
3	3 BTG A - EDUCATION TRAINING DEPT telecomm										
4	4 BTG B - PUBLICATIONS telecom										
5	5 BTG B - PRODUCT MANAGEMENT prod develop.										
6	6 BTG B - COMMUNICATIONS DEPT										
7	7 BTG B - CURRICULUM DEVELOPMENT										
8	8 BTG B - NETWORK ENGINEERING & CONSTRUCTION										
9	9 BTG B - REVENUE REGULATIONS										
10	10 BTG B - SERVICE										
11	11 HTG - OPERATOR SERVICES										
12	12 BTG - CONTROLLER'S DEPT										
13	13 BTG C - NETWORK SERVICES										
14	14 BTG C - BUDGET										
15	15 BTG D - NETWORK STAFF OPERATIONS										
16	16 BTG D - ADMIN SERVICES support										
17	17 BTG C - NETWORK PLANNING										
18	18 BTG D - HUMAN RESOURCES/TRAINING										
19	19 BTG - SECURITY - asset protection										
20	20 BTG F - NETWORK DIMENSIONS traffic eng. of phone systems										
21	TOTAL 0 OR BLANK	0	0	1	1	0	1	1	1	1	1
22	TOTAL 1	7	7	4	6	6	4	6	6	1	1
23	TOTAL 2	0	0	1	0	0	0	0	0	0	1
24	TOTAL 3	1	3	0	0	4	0	0	0	1	0
25	TOTAL 4	0	0	0	0	0	0	0	0	0	0
26	TOTAL 5	0	0	0	0	0	0	0	0	0	0
27	PERCENT 0 OR BLANK	0.00%	0.00%	5.00%	5.00%	0.00%	5.00%	5.00%	5.00%	5.00%	5.00%



Survey of 21/12/27247  
LARGE USER FEATURES/SERVICES  
RANKED BY MEAN RATING

#	Item	mean rating	o/o 4/5	% using
42)	Least Cost Routing	4.6	96.1	89.
45)	Rate of Tariff Changes	4.5	93.	75.
47)	Equip. Inventory - vs - Billed	4.5	89.1	269.3
35)	PBX	4.5	88.7	75
36)	Switcher	4.4	60.1	54
38)	Usage Summary by Dept.	4.3	85.6	75
44)	Expiration Date Report	4.2	82.	64.
41)	Traffic Analysis	4.2	82	82
37)	History Date	4.1	79	39
46)	Usage - vs - Bill Data	4.1	79	29
33)	Adhoc Report	4.1	79	36
24)	Centrex	4.1	29	32
31)	Equip. : Inc. summaries	4.1	79	43
27)	Single Billing Date	4	71	0
28)	You set bill date gpp.	4	68	366 <sup>4/100</sup>
30)	Single remittance all tele com bill	3.8	64	11.
40)	Sum. by Class Uses	3.8	75	25
32)	Special Notice	3.6	57	57
43)	Sum. by Class Equip	3.3	46	21
29)	"Advisory" Summary	3.2	43	7
34)	Weekly Call Summary	3.1	43	21



Array Q# 2148 in rank order by mean rating

CARRIER SERVICE ITEMS

RANK BY MEAN RATING

Q#	Item	mean rating	% 4/5	% usage
24	Coding	2.71 2.7	33.33	50.00
31	Entry, New books	2.58 2.6	20.00	26.67
42	Analys. current billing syst.	2.39 2.4	20.00	36.67
34	3rd Regul. matter	2.37 2.4	26.67	40.00
35	State/Local reg.	2.33 2.3	26.67	36.67
43	Design Bills	2.29 2.3	23.33	36.67
29	Cust. Svcs.	2.26 2.3	20.00	36.67
27	Documentation	2.25 2.3	16.67	40.00
23	Prog. spec	2.21 2.2	23.33	30.00
48	Consult. D/B Design	2.21 2.2	13.33	30.00
22	Bill System Design	2.18 2.2	23.33	36.67
41	Mail Operations	2.18 2.2	20.00	33.33
15	Unit Test	2.07 2.1	16.67	33.33
33	Develop New Svcs	2.04 2.0	13.33	20.00
26	System Test	1.96 2.0	13.33	33.33
39	Delinquent Accts	1.89 1.9	13.33	20.00
44	Assess Pkgd.	1.89 1.9	10.00	30.00
32	Develop New Product	1.83 1.8	10.00	16.67
21	Requirement Def	1.82 1.8	16.67	26.67
40	Bill Process	1.82 1.8	16.67	23.33
28	User-Training	1.71 1.7	10.00	23.33
46	Optimize Bill Process	1.67 1.7	10.00	20.00
30	Separ. & Settlements	1.61 1.6	16.67	20.00
36	Record Collect Rate Trans.	1.46 1.5	6.67	10.00
47	Operate Bill Process	1.44 1.4	16.67	10.00
37	Bill Acctg.	1.37 1.4	16.67	6.67
38	Cust. Acct. Rec'd	1.37 1.4	16.67	6.67
45	Select Bill Process	1.33 1.3	33.33	10.00





INPUT

ORDER/INVOICE/FULFILLMENT

Y611

ORIGINATOR (SIGNATURE) <i>[Signature]</i>		PREPARED BY: <i>Out</i>		DATE: <i>5/28/85</i>			
ACTIVITY	<input checked="" type="checkbox"/> NEW ORDER	<input type="checkbox"/> FULFILLMENT ONLY	COMMISSION TO: <i>Out 100%</i>	SOLD BY: <i>Out 100%</i>	APPROVED <i>[Signature]</i>		
	<input type="checkbox"/> CONTINUATION	<input type="checkbox"/> SINGLE INVOICING	_____ %	_____ %	INITIAL		
	<input type="checkbox"/> CHANGE	<input checked="" type="checkbox"/> MULTI-INVOICING: <i>2</i>	_____ %	_____ %	<i>5/28/85</i>		
	<input type="checkbox"/> CANCEL	<input type="checkbox"/> NO. INVOICES _____	_____ %	_____ %	DATE		
	<input type="checkbox"/> SPECIAL:	<input type="checkbox"/> PENDING:	_____ %	_____ %			
PRODUCT	<input type="checkbox"/> SUBSCRIPTION	US <input type="checkbox"/> UK <input checked="" type="checkbox"/>	PROJ. ID/YEAR <i>Y611</i>	TITLE OR DESCRIPTION			
	<input type="checkbox"/> CUSTOM			<i>CELLULAR RADIO</i>			
	<input type="checkbox"/> MULTICLIENT			AMOUNT <i>\$38,800</i>			
	<input type="checkbox"/> REPORTS						
	<input type="checkbox"/> COPIES						
CLIENT AUTH.	<input type="checkbox"/> CONSULT/PRESENT.						
	<input type="checkbox"/> TAPES/MATERIALS						
	<input type="checkbox"/> REIMBURSED COSTS						
	P.O. # _____ INPUT CONTRACT <input type="checkbox"/> LETTER <input type="checkbox"/> VERBAL <input type="checkbox"/>						
	ATTACH ALL AUTHORIZING DOCUMENTS TO WHITE (CONTRACT) COPY.						
ORIGINATOR	SHIP TO: * NAME <i>MR. PATRICIA H. PRICE</i>			INVOICE TO: (IF DIFFERENT) NAME _____			
	TITLE <i>MR. NEW BUSINESS VENTURES</i>			TITLE _____			
	COMPANY <i>GTE DATA SERVICES</i>			COMPANY _____			
	ADDRESS <i>FIRST FLORIDA TOWER</i>			ADDRESS _____			
	<i>P.O. Box 1548</i>			_____			
INVOICE	<i>TAMPA FL 33601</i>			PHONE ( ) _____			
	PHONE <i>(813) 224-3054</i>			_____			
	* <input type="checkbox"/> Check here if more than one shipping address and attach names and addresses to green (fulfillment) copy.			* <input type="checkbox"/> Check here for address change to mail list.			
	INVOICE TO READ: (FOR OTHER THAN STANDARD WORDING)						
	_____						
O.I.F. ONLY	SPECIAL INSTRUCTIONS FOR HANDLING, BILLING, STAGGERED OR DELAYED PAYMENTS, ETC.						
	<i>50/50 SPl.17</i>						
	_____						
	_____						
	_____						
ORIGINATOR/SHIPPING FULFILLMENT	INV. COMP.	BY:	DATE:	CLIENT #:	ORDER #:	INV. #:	MULTI-INVOICING
	OF _____						
	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE	ITEM DESCRIPTION OR TITLE	NO.	BY
FULFILLMENT TO BE COMPLETED IN: <input type="checkbox"/> PALO ALTO <input type="checkbox"/> LONDON <input type="checkbox"/> OTHER _____							





GTE Data Services Incorporated  
First Florida Tower  
P O Box 1548  
Tampa, Florida 33601  
813 224-3131

June 10, 1986

4611

Mr. D. W. Fostle, Vice President  
INPUT  
Suite 201  
959 Route 46 East  
Parsippany, NJ 07054

Dear Mr. Fostle:

Enclosed in duplicate is the letter agreement dated May 13, 1986 between INPUT and GTE Data Services Incorporated (GTEDS) covering services to be provided by INPUT relative to cellular billing market potential. Please note that on page 5 of the letter agreement I have added a PROJECT START DATE section and on page 6 have added a sentence at the end of the SCHEDULE & FEES section. Also enclosed in duplicate is a "Work Made for Hire" and Confidentiality Agreement, substantially identical to the one previously executed for another project, relating to this project. The signature block of this agreement contains space for signature by INPUT's employees who will be working on this project.

Both copies of these documents have been signed, and the additions to the letter agreement initialled, on behalf of GTEDS by David K. Denmark, Procurement Director. Please execute both copies of both documents on behalf of INPUT and obtain the signatures of INPUT's employees who will be working on the cellular billing project. One fully-executed set of these documents should be retained by you for your file and the other returned to me for GTEDS' file.

Also enclosed is GTEDS' Purchase Order No. 55401. This number must appear on INPUT's invoices.

If I may be of any assistance or if you have any questions, please feel free to give me a call at (813) 224-3746.

Sincerely,

Elizabeth A. Stalvey  
Contract Administrator

Enclosures

cc: J. Lambert  
P. Price



May 13, 1986

Mrs. Patricia H. Price  
Manager-New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, Florida 33601

Dear Mrs. Price:

This proposal is presented in response to your request for further information on the prospects of the market for cellular bill processing. Bill processing is used in the generic sense and includes service order, CRIS, number assignment and other related functions rather than applying strictly to "edit-rate-print-mail" bill production. It expands upon our earlier study outline in the letter of February 24, 1986 and develops the basic concepts presented there more fully in light of recent discussions and developments.

#### UNDERSTANDING

INPUT understands that GTEDS wishes to build upon its recently developed base in Mobilnet cellular processing which is moving in-house from an outside source. We further understand that preliminary discussions have been held with a current provider of cellular billing services regarding the possibility of acquiring their processing business and that GTEDS may be interested in acquiring the business of other billing providers. To determine the appropriate level of investment in this form of processing it becomes necessary to understand the market for these services and its segmentation, market growth,

2



pricing practices and likely future course over the next five years. Additionally it is important to understand the actions of the competitors of which there are at least nine firms. INPUT expects that perhaps four or five of these firms would be directly competitive to GTEDS. To the cellular billing arena GTEDS believes it brings certain powerful advantages. Among these are:

1. Strong knowledge of billing systems.
2. Excellent operational skills.
3. Massive processing capacity in several computing centers.
4. Efficient, low-cost processing ability.

GTEDS personnel find the market attractive because of its apparent congruence with GTED's skills and expected rapid growth.

#### INFORMATION REQUIRED

Based upon discussions, there are three key areas in which further information appears needed to develop an acceptable forecast and participation strategy.

1. Growth of new cellular operators, particularly non-wireline providers, their switch characteristics, "live" dates, financial status and ownership. GTEDS personnel believe that this group has particularly high potential.

Additional thereto, INPUT believes that there may also be significant potential at operating wireline providers due to rumors of dissatisfaction with current billing services.

These two elements should be combined to provide a segmented total forecast of the number of bills to be produced annually for the next three to five years. This may be considered the "gross market potential"





2. The second key area is competitive positioning, strategy and tactics, as well as pricing. With the addition of this data a net market potential may be developed as well as the dollar volume of the market.
3. The third key area is user perceptions, plans and intentions. Conditioned upon this data, it is feasible to develop an available market forecast. Due to the possibility that major celular providers may move billing in-house, it is conceptually possible that the available market may shrink while the market as a whole grows rapidly. It is further possible that new operators may not have volume sufficient to warrant a "mainframe service solution" and will be able to bill adequately with micro or mini-based systems. These operators would also be "unavailable" to GTEDS.

We feel strongly that the market for cellular billing services is distinct from the market for cellualr telephone service (although related) and requires a specific and somewhat different approach.

Accordingly, we see the task as divisible into the following parts:

PART 1. - Segment the market by wireline/non-wireline, operating and emerging. Determine from secondary sources supplemented by primary research (if needed) the operational status, size and billing source for the carriers. A further segmentation by market size may be needed, e.g. Top 30, second thirty, etc. Determine the areas of greatest "gross" opportunity.



PART 2. - Determine the pricing policies of the various competitors, principal systems features, hardware type and related data for an agreed set of competitors, most likely IBM-mainframe based, but to include other hardware such as micro's. This activity will have two purposes: 1) the data is directly related to the market sizing exercise and 2) evaluating competitors as potential acquisition candidates. Efforts will also be made to determine clients at this stage although client name data is essentially derived from PART 3.

The prime objective of PARTS 1 & 2 is to understand as fully as possible segmentation and competitors to maximize the outputs of PART 3.

PART 3. - This part requires a telephone survey of cellular operators to determine:

- a. Current processing method.
- b. Service features most used, i.e. S.O.E., on-line account history, trouble reporting, automatic number assignment, etc.
- c. Service features most desired (but not available from current source).
- d. Expected growth in number of bills produced.
- e. Satisfaction with current service; problems if any.
- f. Future bill processing plans including in-house.
- g. Satisfaction with current pricing.
- h. Likelihood of changing billing service in the future, e.g. next year, two years.
- i. Price sensitivity.
- j. Other significant factors to be jointly determined including those which may emerge from PARTS 1 & 2 through analysis.



On the presumption that GTEDS' interest does not extend below the top 90 (ninety) markets and that there is a potential of two carriers per market, we have a universe of 180 respondents. INPUT recommends that a sample be drawn from this group of 60 operators (or potential operators). This will provide 90% confidence in yes/no answers at +/- 6% (approximately), a degree of accuracy sufficient for the present purpose.

We believe the above method will allow GTEDS to make decisions with confidence, compete effectively in the market if warranted and isolate attractive venture partners or acquisition suspects. It will be especially effective in determining objectively the true prospects of the entities in which GTEDS currently has an acquisition interest. Most importantly, it will provide proper forecasts of billing volumes, expenditures, satisfaction levels and related factors which will permit GTEDS to make informed judgements regarding the degree and type of participation warranted by market conditions and cellular operator practices, plans and intentions.

INPUT wishes to note that all items in the memo of May 9 ("Studies") will be covered in this proposed engagement. Additionally INPUT will provide ad hoc consulting based on prior experience in the study of billing systems (and cellular in particular) to assist GTEDS in formulating an effective preliminary strategy during the time this engagement is being executed. An onsite presentation of all study findings, analyses and recommendations will be made.

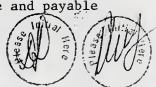
PROJECT START DATE: May 23, 2986





## SCHEDULE & FEES

INPUT believes it will be able to accomplish Parts 1 & 2 of this engagement (segmentation and basic competitors) within three weeks of receipt of signed authorization. We further believe it is possible to execute PART 3 including questionnaire design, sampling, interviewing and analysis within 7-8 weeks with no allowance made for intervening holidays. The fee for the engagement is \$38,800.00 which is payable in two equal installments of \$19,400, one at the onset of the engagement and the other at its conclusion. Expenses for travel, expedited shipping, documents acquired solely for this engagement and related incidental items will be billed at documentable cost at the conclusion of the engagement. Expenses will not exceed 5% of the engagement fee without the specific permission of the GTEDS project manager. Fees shall be due and payable within thirty (30) days after GTEDS' receipt of INPUT's invoice.



## CONCLUSION

Based on its prior experience in the study of the market for these systems and similar ones, knowledge of the competitors and extensive experience in market assessments, INPUT feels that it is extremely well-qualified to undertake this study for GTEDS. If there are any questions please address them to the undersigned. To give effect to this agreement it is only necessary to sign in the space provided below. Thank you for thinking of INPUT.

Sincerely,

D. W. Fostle  
Vice President

Accepted by GTE DATA SERVICES:

Name: DAVID K. DENMARK

Title: PROCUREMENT DIRECTOR

Date: JUN 9 1986

Signature: [Handwritten Signature]

Accepted by INPUT:

Name: D.W. Fostle

Title: VICE PRESIDENT

Date: JUNE 14, 1986

Signature: [Handwritten Signature]





# GTE Data Services



SHIPMENT HEREUNDER CONSTITUTES ACCEPTANCE  
BY VENDOR OF ALL PROVISIONS HEREOF  
INCLUDING THOSE ON THE REVERSE SIDE.

## PURCHASE ORDER

SEND ALL INVOICES.  
IN TRIPLICATE, TO:

GTE DATA SERVICES  
GENERAL ACCOUNTING  
P.O. BOX 1548  
TAMPA, FLORIDA 33601

SEND ALL ACKNOWLEDGEMENTS,  
SHIPPING SCHEDULES, AND  
CORRESPONDENCE TO:

GTE DATA SERVICES  
PURCHASING  
P.O. BOX 1548  
TAMPA, FLORIDA 33601

► PURCHASE ORDER NO. MUST APPEAR  
ON ALL PACKAGES, INVOICES,  
AND CORRESPONDENCE

**PURCHASE ORDER NO.** 55401

**DATE** 06-09-86

**DATE REQUIRED**  
ASAP

TO:

• INPUT  
• Attn.: Mr. D. Fostle  
• Parsippany Place Corp. Center  
• Suite 201, 959 Rt. 46 East  
• Parsippany, NJ 07054

SHIP  
TO:

GTE DATA SERVICES INCORPORATED  
• 111 East Madison Street  
• Tampa, FL 33602  
•  
ATTN OF: J. Lambert

DC 166

ORIGINATED BY	DEPARTMENT	GEN. LEDGER ACCT NO	REQ/CONTROL NO	BUDGET CONT NO	DATE REQ. REC'D	TERMS	FOB
Lambert, J.	CSDV	32-350 774	22325	705	06-09-86	As due	N/A

QUANTITY		UNIT	DESCRIPTION	ESTIMATED COST	
RECEIVED	ORDERED			UNIT COST	TOTAL
			THIS IS A BLANKET PURCHASE ORDER FOR THE FOLLOWING:  Market Analysis of need for cellular bill processing payable in (two (2) equal installments of \$19,400) Engagement expenses not to exceed:		38,800.00  1,940.00 \$40,740.00
			ALL INVOICES MUST SHOW THE ABOVE BLANKET PURCHASE ORDER NUMBER.		

GTE DATA SERVICES

BY *M. R. Stalling*  
PURCHASING REPRESENTATIVE



## **"WORK MADE FOR HIRE" AND CONFIDENTIALITY AGREEMENT**

This Agreement, dated as of May 23, 1986, is made between GTE Data Services Incorporated ("GTEDS"), INPUT, and INPUT's employee(s) assigned to this project (INPUT and such employee(s) are collectively referred to herein as "Consultant") in connection with consulting services to be provided to GTEDS by INPUT pursuant to a letter agreement between the parties, dated May 13, 1986, relating to GTEDS' proposed entry into the cellular billing market.

The parties hereto expressly agree that the work to be performed by Consultant pursuant to the above-referred to letter agreement (including any extension thereof) is specifically ordered by GTEDS and shall be considered a work made for hire as defined by the Copyright Act, 17 U.S.C. §101.

The parties recognize that in order to perform this work, Consultant will need access to certain information which is confidential and proprietary to GTEDS and its suppliers and customers, and which GTEDS is unwilling (or in some cases not legally authorized) to disclose without adequate assurances that such information will be properly used and protected. Accordingly, Consultant voluntarily assumes the following obligations:

In consideration of the disclosure of Confidential and Proprietary Information, Consultant hereby agrees as follows:

1. "Confidential and Proprietary Information" shall mean information in oral or written form relating to the business or products of GTEDS, its suppliers and customers, including present status, plans and capabilities as well as the technology, architecture, data bases, and software associated therewith.
2. Consultant shall maintain all Confidential and Proprietary Information disclosed or received in confidence, and shall use it only for the purpose of performing the work called for pursuant to the above-referred to letter agreement; shall not disclose Confidential and Proprietary Information to third parties; shall not copy Confidential and Proprietary Information, in whole or in part, without the prior written consent of GTEDS (except when such copying is done as a function of Consultant's work for GTEDS); and shall return the original and all copies of Confidential and Proprietary Information to GTEDS promptly following completion of the work to be performed pursuant to the above-referred to letter agreement or upon the request of GTEDS, whichever shall first occur.
3. Consultant shall have no obligation to keep confidential information which:
  - a. is already in Consultant's possession prior to disclosure by GTEDS;
  - b. is, or becomes, public knowledge other than by breach of this agreement;
  - c. is disclosed to Consultant by a third party rightfully in possession of same; or
  - d. is required to be disclosed by valid order of a court or other governmental body, or otherwise required by law.



4. Consultant's obligations hereunder with respect to handling, maintaining in confidence, and limited use of Confidential and Proprietary Information disclosed during Consultant's performance pursuant to the above-referred to letter agreement shall survive for a period of five years from the date hereof, and Consultant shall thereafter have no obligation with respect thereto.

Consultant further agrees that while on GTEDS' premises to observe all working rules applicable to GTEDS' employees during similar work.

In witness whereof, the parties have executed this agreement as of the date first set forth above.

INPUT

By D.W. FOSTLE  
Name D.W. FOSTLE  
Title VICE PRESIDENT  
Date 6/17/86

GTE DATA SERVICES INCORPORATED

By [Signature]  
Name \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

INPUT'S EMPLOYEES ASSIGNED TO PROJECT

Printed Names:

SOUELYNE HILAIRE  
Beth Ann Van Benschoten  
Lisa Percy  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signatures:

[Signature]  
[Signature]  
[Signature]  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Don  
FYI  
Renee

**(415) 960-3990**

# INVOICE

TO: • GTE Data Services  
P.O. Box 1548  
First Florida Tower  
Tampa, FL 33601

REF: Ms. Patricia Price  
Manager

**ATTENTION:** • Accounts Payable

[illegible]

INPUT FEDERAL ID# 94-2385674

10/20





INPUT

## ORDER/INVOICE/FULFILLMENT

ORIGINATOR (SIGNATURE) *[Signature]*PREPARED BY: *CAF*DATE: *1/28/88*

ACTIVITY	<input checked="" type="checkbox"/> NEW ORDER	<input type="checkbox"/> FULFILLMENT ONLY	COMMISSION TO: <i>MT 100%</i>	SOLD BY: <i>CAF 100%</i>	APPROVED <i>[Signature]</i> INITIAL <i>SP/RS</i> DATE
	<input type="checkbox"/> CONTINUATION	<input type="checkbox"/> SINGLE INVOICING	%	%	
	<input type="checkbox"/> CHANGE	<input checked="" type="checkbox"/> MULTI-INVOICING:	%	%	
	<input type="checkbox"/> CANCEL	NO. INVOICES <i>2</i>	%	%	
	<input type="checkbox"/> SPECIAL:	<input type="checkbox"/> PENDING:	%	%	

PRODUCT	<input type="checkbox"/> SUBSCRIPTION	US <input checked="" type="checkbox"/> PROJ. ID/YEAR	TITLE OR DESCRIPTION	AMOUNT
	<input type="checkbox"/> CUSTOM	<i>Y611</i>	<i>CELLULAR RADIOS</i>	<i>38,800</i>
	<input type="checkbox"/> MULTICLIENT			
	<input type="checkbox"/> REPORTS			
	<input type="checkbox"/> COPIES			
	<input type="checkbox"/> CONSULT/PRESENT.			
	<input type="checkbox"/> TAPES/MATERIALS			
<input type="checkbox"/> REIMBURSED COSTS				

P.O. # \_\_\_\_\_ INPUT CONTRACT ☐ LETTER ☐ VERBAL ☐

ATTACH ALL AUTHORIZING DOCUMENTS TO WHITE (CONTRACT) COPY.

SHIP TO:	NAME: <i>Mrs. Patricia H. Price</i>	INVOICE TO: (IF DIFFERENT) NAME _____
	TITLE: <i>MR. ROYAL VENTURES</i>	
	COMPANY: <i>DATA SERVICES</i>	
	ADDRESS: <i>10A TOWER</i>	
	<i>1548</i>	
	<i>23601</i>	
PHONE ( ) <i>3086</i>	PHONE ( ) <i>3086</i>	

\* ☐ Check here if more than one shipping address and attach names and addresses to green (fulfillment) copy. \* ☐ Check here for address change to mail list.

INVOICE TO READ: (FOR OTHER THAN STANDARD WORDING)

SPECIAL INSTRUCTIONS FOR HANDLING, BILLING, STAGGERED OR DELAYED PAYMENTS, ETC.  
*150 SP/17*

O.I.F. ONLY	INV. COMP.	BY: <i>RF</i>	DATE: <i>6/86</i>	CLIENT #:	ORDER #: <i>5172</i>	INV. #: <i>13209</i>	MULTI-INVOICING OF _____
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ORIGINATOR/SHIPPING FULFILLMENT	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE

FULFILLMENT TO BE COMPLETED IN: ☐ PALO ALTO ☐ LONDON ☐ OTHER \_\_\_\_\_

1-1

May 13, 1986

Y611

Mrs. Patricia H. Price  
Manager-New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, Florida 33601

Dear Mrs. Price:

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## SCHEDULE & FEES

INPUT believes it will be able to accomplish Parts 1 & 2 of this engagement (segmentation and basic competitors) within three weeks of receipt of signed authorization. We further believe it is possible to execute PART 3 including questionnaire design, sampling, interviewing and analysis within 7-8 weeks with no allowance made for intervening holidays. The fee for the engagement is \$38,800.00 which is payable in two equal installments of \$19,400, one at the onset of the engagement and the other at its conclusion. Expenses for travel, expedited shipping, documents acquired solely for this engagement and related incidental items will be billed at documentable cost at the conclusion of the engagement. Expenses will not exceed 5% of the engagement fee without the specific permission of the GTEDS project manager.

## CONCLUSION

Based on its prior experience in the study of the market for these systems and similar ones, knowledge of the competitors and extensive experience in market assessments, INPUT feels that it is extremely well-qualified to undertake this study for GTEDS. If there are any questions please address them to the undersigned. To give effect to this agreement it is only necessary to sign in the space provided below. Thank you for thinking of INPUT.

Sincerely,

  
D. W. Fostle  
Vice President

Accepted by GTE DATA SERVICES:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Accepted by INPUT:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_



THE MARKET FOR CELLULAR BILLING SERVICES

SPECIAL STUDY FOR

GTE DATA SERVICES

September 12, 1986

INPUT  
Parsippany Corporate Center  
Suite 201  
959 Route 46 East  
Parsippany, New Jersey 07054  
(201) 299-6999

INPUT





## INTRODUCTION

- o IN MID-JUNE GTE DATE SERVICES COMMISSIONED A STUDY OF THE MARKET FOR CELLULAR BILLING SERVICES IN ORDER TO BETTER POSITION ITS ACTIVITIES IN THIS ARENA.
- o IN CONJUNCTION WITH INPUT A TELEPHONE SURVEY QUESTIONNAIRE WAS DEVELOPED AND ADMINISTERED TO 61 WIRELINE AND NON-WIRELINE OPERATORS OF CELLULAR SERVICES IN THE TOP 90 MARKETS.
- o DATA WAS GATHERED ON A WIDE RANGE OF REVELANT ITEMS INCLUDING:
  - CURRENT PROCESSING SOURCE
  - SERVICE FEATURES USED
  - SERVICE FEATURES DESIRED
  - EXPECTED GROWTH
  - SATISFACTION WITH SERVICE
  - PRICING
  - LIKELIHOOD OF CHANGING SERVICES
  - USEFULNESS OF SPECIFIC GTE-PROPOSED FEATURES -OTHER ITEMS

**INPUT**



## INTRODUCTION (cont'd)

- o THIS REPORT SETS FORTH STUDY FINDINGS IN THESE AND RELATED AREAS ALONG WITH INPUT'S ESTIMATE OF THE SIGNIFICANCE OF THESE ITEMS.
- o OF THE 61 COMPANIES REPORTED IN THIS STUDY 27.9% (17) WERE WIRELINES WHILE 72.1% WERE NON-WIRELINES.
- o WITH WIRELINES, IT IS IMPORTANT TO NOTE THAT BILLING IS HIGHLY CENTRALIZED AND CONSOLIDATED. THESE ARE "SINGLE LOCATION" BILLERS. OFTEN THEY HAVE LONG-STANDING BILLING RELATIONSHIPS.
- o DESPITE THESE LONG-TERM RELATIONSHIPS, THE DEGREE OF SATISFACTION IS NOT ALWAYS HIGH. OVERALL, SATISFACTION WITH BILLING SERVICES IS NOT OUTSTANDING COMPARED TO MANY SERVICES INPUT HAS EVALUATED.
- o OVERALL QUALITY JUDGMENT ON A SCALE OF 1-5 IS A 3.4 WITH 11.5% RATING SERVICE AS EXCELLENT OR "5."

**INPUT**



INTRODUCTION (cont'd)

- o EQUALLY OR PERHAPS EVEN MORE SIGNIFICANT IS THE FACT THAT 23% STATE IT IS "HIGHLY LIKELY" (5) THAT THEY WILL CONSIDER CHANGING BILLING SERVICE PROVIDERS. ANOTHER 23% RATE THE PROBABILITY OF CHANGING PROVIDER AS A "4." A TOTAL OF 46% INDICATE, THEREFORE, THAT IT IS LIKELY THEY WOULD CHANGE BILLING SERVICES.
- o INPUT CONSIDERS THIS TO BE A HIGHLY VOLATILE MARKET WITH LESS THAN SATISFACTORY SERVICE LEVELS TO USERS IN EVIDENCE. AS SUCH, IT MAY PRESENT AN OPPORTUNITY TO GTEDS.

**INPUT**



#### SATISFACTION DETAIL AND CHANGE PROPENSITY

<u>COMPANY</u>	<u>N</u>	<u>QUALITY MEAN</u>	<u>% HIGH QUALITY</u>	<u>CHANGE MEAN</u>	<u>% HIGH CHANGE</u>
AUXTON	5	3.0	40	3.4	60
CINN. BELL	4	3.0	25	3.5	50
CBSI	15	3.4	33	3.6	53
CELLTECH	12	3.1	17	4.3	75
BANK ILL.	5	2.6	20	4.6	100

- o DATA EXCLUDES "OTHER" AND INHOUSE RESPONDENTS AND CONCENTRATES ON FULLY INDEPENDENT BILLING SERVICES.
- o NOTE THAT FOR ALL VENDORS THE MEAN CHANGE RATING EXCEEDS THE MEAN SATISFACTION RATING. WHILE NOT STATISTICALLY SIGNIFICANT AT THESE SMALL CELL SIZES, THE TREND IS CLEAR.
- o MORE IMPORTANTLY, OBSERVE THE PROPORTIONS FOR HIGH QUALITY SERVICE (4 OR 5 RATE) VERSUS THE HIGH WILLINGNESS TO CONSIDER CHANGE.

**INPUT**





**SATISFACTION** (cont'd)

- o SPECIFICALLY OBSERVE THAT ALL BANK OF ILLINOIS RESPONDENTS ARE HIGHLY LIKELY TO CHANGE AND THAT 3 OUT OF 4 CELLTECH R'S ARE ALSO HIGHLY LIKELY. FOR THESE TWO ALSO NOTE THAT LESS THAN 1 IN 5 RESPONDENTS RATES SERVICE QUALITY AS HIGH.
- o DURING THE COURSE OF THIS STUDY CINCINNATI BELL ACQUIRED CBSI. SIGNIFICANTLY, NEITHER IS STRONG IN SATISFACTION WITH ABOUT HALF OF EACH CLIENT BASE HIGHLY LIKELY TO CONSIDER CHANGING VENDORS. THIS SUGGEST THAT CINCINNATI BELL HAS NOT ACQUIRED A STRONG AND LOYAL CLIENT BASE AND WOULD SEEM TO HAVE PROBLEMS WITH ITS OWN CLIENTS. CINCINNATI BELL, IN INPUT'S OPINION, HAS A MAJOR CHALLENGE IS STABILIZING TWO CLIENT BASES ON TWO SEPARATE SYSTEMS.
- o LIKEWISE AUXTON DOES NOT APPEARS TO HAVE SERVED ITS CLIENTS PARTICULARLY WELL WITH 60% VERY LIKELY TO CONSIDER CHANGE.

**INPUT**



**SATISFACTION** (cont'd)

- o WE CONCLUDE THAT RESPONDENTS DO NOT BELIEVE THAT THEY ARE PARTICULARLY WELL-SERVED BY THEIR VENDORS AND THAT THEY EXHIBIT RELATIVELY LOW LOYALTY.
- o IF GTEDS CAN PROVIDE A CREDIBLE ALTERNATIVE IT SHOULD FIND THE TASK OF PRESENTING ITS SERVICE "CASE" TO BE RELATIVELY EASY. THESE RESPONDENTS ARE NOT WED TO THEIR CURRENT SUPPLIERS AND SHOULD READILY CONSIDER ALTERNATIVES.
- o WHILE CELLTECH AND BANK OF ILLINOIS CLIENTS ARE PARTICULARLY VULNERABLE, NO VENDOR EXHIBITS STRONG ABILITY TO HOLD CUSTOMERS.

**INPUT**



### MARKET GROWTH AND SIZE

- o RESPONDENTS ARE EXTREMELY BULLISH ON THE GROWTH OF CELLULAR. THE MEAN FORECAST GROWTH 1986-1987 WAS 71.9%. IN CONSIDERING THIS FORECAST, IT MUST BE RECOLLECTED THAT IT IS BIASED BY THE HIGH PROPORTION OF NON-WIRELINES IN START-UP MODE WHICH AVERAGED ABOUT 2,700 CURRENT SUBSCRIBERS. THIS WILL GROW TO ABOUT 4,200 IN MID-1987.
- o LONGER TERM (3 YEAR HORIZON) RESPONDENTS EXPECT 49.8% ANNUAL AVERAGE GROWTH. THIS WOULD PLACE THE AVERAGE NON-WIRELINE RESPONDENT AT 9200 SUBSCRIBERS IN MID-1989. THIS IMPLIES ANNUALIZED BILLS OF ABOUT 110,000 PER RESPONDENT IN 1989.
- o THERE IS SUBSTANTIAL VARIATION ABOUT THE MEAN GROWTH FOR INDIVIDUAL RESPONDENTS. IN GENERAL, GROWTH ESTIMATES APPEAR TO BE INVERSELY RELATED TO SIZE OF SUBSCRIBER BASE.

**INPUT**



MARKET GROWTH AND SIZE (cont'd)

BASED ON TRADE DATA ON THE NUMBER OF SUBSCRIBERS AS OF 1/86 AND THE RESPONDENT-PROVIDED GROWTH ESTIMATES THIS WOULD RESULT IN A SUBSCRIBER BASE OF 1.07 MILLION UNITS AT 1/89, UP FROM THE CURRENT (1/86) 320,000 SUBSCRIBERS. SUCH A COUNT WOULD GENERATE 12.9 MILLION ANNUAL BILLS. AT AN AVERAGE OF \$2.50 PER BILL THIS IMPLIES THE EXISTENCE OF A \$33.3 MILLION PROCESSING MARKET IN 1989.

- o AS SPECIALIZED MARKETS GO, THIS IS NOT PARTICULARLY LARGE. IF ORDINARILY PROFITABLE (FOR PROCESSING) WE WOULD EXPECT A "NET" PROFIT IN THE MARKET OF \$2-3 MILLION AT THESE VOLUMES IN 1989. THIS WOULD BE DIVIDED AMONG THE PARTICIPANTS.
- o SINCE A VERY AMBITIOUS 50% "SHARE" WOULD IMPLY PROFITS OF \$1-1.5 MILLION IN 1989, WE WOULD STRONGLY SUGGEST THAT GTEDS CONDITION ITS PARTICIPATION BY REALISTIC ASSESSMENTS OF RETURN ON INVESTMENT.

— INPUT —





**MARKET GROWTH AND SIZE** (cont'd)

- o DEPENDING UPON THE ECONOMICS OF MOBILNET'S PROCESSING REQUIREMENTS, IT MAY BE APPROPRIATE TO PLACE CONSIDERABLE VALUE ON THE ADD-ON "OUTSIDE" BUSINESS EVEN THOUGH THE MARKET IS NOT LARGE.
- o WE CONCLUDE THAT CELLULAR MARKET IS EXPECTED TO GROW RAPIDLY BY RESPONDENTS OVER THE NEXT THREE YEARS. COMBINING RESPONDENT GROWTH FORECASTS WITH TRADE SUBSCRIBER DATA AND ESTIMATED COST DATA LEADS TO A PROJECTION OF A MODERATE MARKET SIZE IN 1989. THIS MARKET IS BELIEVED TO BE SUFFICIENT TO WARRANT CAREFUL INCREMENTAL INVESTMENT BEYOND MOBILNET REQUIREMENTS.
- o NOTE: RESPONDENTS IN THIS STUDY REPORTED 149,950 SUBSCRIBERS OR ABOUT 47% OF THE 1/86 CTIA BASE OF 320,000. THIS IS THOUGHT TO BE AN AMPLE PROPORTION FOR MARKET ESTIMATION PURPOSES.

**INPUT**



### SYSTEM FEATURES

- o EXTENSIVE DATA WAS GATHERED ON SYSTEM FEATURES AND THEIR USE. ALSO GATHERED WAS DATA ON THE IMPORTANCE OF THESE FEATURES AT THE PRESENT TIME AND THREE YEARS IN THE FUTURE.
- o A TOTAL OF 30 SYSTEM FEATURES WAS TESTED. THE FEATURES FOR TEST WERE JOINTLY DEVELOPED BY GTEDS AND INPUT PERSONNEL.
- o RESPONDENTS WERE ASKED WHETHER OR NOT THEIR CURRENT SYSTEM PROVIDED THE CAPABILITY. THEY WERE THEN QUERIED AS TO HOW IMPORTANT THE FEATURE WAS (OR WOULD BE) IN THEIR OPERATIONS.
- o IMPORTANCE - BOTH CURRENT AND FUTURE - WAS RATED ON A ONE TO FIVE (1-5) SCALE WITH "1" DESIGNATED AS UNIMPORTANT" AND "5" DESIGNATED AS "VERY IMPORTANT."

**INPUT**



### SYSTEM FEATURES (cont'd)

- o FEATURE RATINGS VARIED BETWEEN 1.8 TO 4.9. THE RANGE OF VARIATION INDICATES THAT THE DIFFERENCE BETWEEN FEATURES IS MEANINGFUL TO RESPONDENTS.
- o SUBSTANTIAL VARIATION WAS ALSO OBSERVED IN THE PROPORTION EMPLOYING THE FEATURES. PROPORTION WITH A SPECIFIC FEATURE RANGED FROM 6.6% TO 75.4%.
- o OF THOSE FEATURES TESTED, 40% INCREASED IN IMPORTANCE NOW VERSUS 3 YEARS IN THE FUTURE IN A STATISTICALLY SIGNIFICANT WAY I.E., 90% CONFIDENCE INTERVAL. THEY ARE PRESENTED IN THE TABLE.

**INPUT**



## SYSTEM FEATURES (cont'd)

### SIGNIFICANT CHANGE FEATURES

<u>FEATURE</u>	<u>% USE NOW</u>	<u>RATING NOW</u>	<u>RATING 3 YRS</u>	<u>DELTA</u>
AUTO INTERFACE	24.6	4.1	4.7	.6
CENTRAL SWITCH MGMT.	55.7	4.0	4.6	.6
SINGLE CLEAR ROAMERS	13.1	4.0	4.6	.6
ELEC. DATA XFER.	11.5	3.3	4.4	1.1
ROAMER RCVABL.	9.8	3.8	4.3	.5
LOCK BOX	47.5	3.5	4.2	.7
MULTI-SITE BACKUP	27.9	3.6	4.2	.6
MULTIPLE BILL CYCLES	29.5	2.6	3.7	1.1
BILL ON DEMAND	8.2	2.7	3.7	1.0
BALANCE CYCLE LOADS	23.0	2.8	3.6	.8
LASER PRINTING	16.4	2.8	3.5	.7
REMOTE ACCT. INIT.	13.1	2.3	2.1	.8

- o RANKING IS BY HIGH FUTURE IMPORTANCE.

**INPUT**





### SYSTEM FEATURES (cont'd)

- o CERTAIN OF THESE FEATURES ARE POTENTIAL DIFFERENTIATORS OF A GTEDS OFFERING IN THAT THEY ARE PERCEIVED AS HIGHLY IMPORTANT BUT ARE ONLY IN LIMITED USE BY 1/4 OR LESS OF RESPONDENTS. THEY COULD CONSTITUTE AN IMPORTANT DEVELOPMENT AGENDA AND SHOULD DISTINGUISH GTEDS SERVICE FROM THE COMPETITION.
- o DIFFERENTIATORS INCLUDE:
  - AUTOMATIC INTERFACE TO MTSO
  - A SINGLE CLEARING HOUSE FOR ROAMERS
  - ELECTRONIC DATA TRANSFER INSTEAD OF TAPE
  - INTER-COMPANY ROAMER RECEIVABLES BY CLEARING HOUSE
  - MULTI-SITE PROCESSING FOR BACKUP
- o IMPORTANCE IS SOMEWHAT LOWER BUT STILL CONSIDERABLE FOR:
  - MULTIPLE BILLING CYCLES
  - BILLING ON DEMAND
  - BALANCED LOADING CYCLES

**INPUT**



**SYSTEM FEATURES** (cont'd)

- o MULTIPLE BILLING CYCLES AND BILLING ON DEMAND ARE CHARACTERIZED BY VERY STEEP IMPORTANCE INCREASES AND LOW TO VERY LOW CURRENT INCIDENCE, BOTH DESIRABLE CHARACTERISTICS.
- o LASER PRINTING AND REMOTE ACCOUNT INITIATION FOR AGENTS ARE CHARACTERIZED BY LIMITED CURRENT USE AND LESSER IMPORTANCE. IF EASILY PROVIDED THEY COULD BE OFFERED BUT ARE NOT MANDATORY FOR SUCCESSFUL DIFFERENTIATION IN THIS MARKET.
- o GIVEN THE PARTICULARLY HIGH DELTAS AND LOW UTILIZATIONS FOR ELECTRONIC DATA TRANSFER, MULTIPLE BILLING CYCLES AND BALANCED CYCLE LOADS THESE SHOULD BE EARLY IN ANY DEVELOPMENT AGENDA.

**INPUT**



**SYSTEM FEATURES** (cont'd)

- o THE ROAMER FUNCTIONS ARE, IN ALL LIKELIHOOD, EXTREMELY COMPLEX TO IMPLEMENT AND FOR THIS REASON WOULD NOT BE RECOMMENDED FOR "FAST" DEVELOPMENT. THEY ALSO IMPLY A ROAMER "LINE OF BUSINESS" WHICH CANNOT BE RECOMMENDED (OR NOT RECOMMENDED) BASED ON THIS RESEARCH AS THE ROAMER ISSUE IS EXTREMELY COMPLEX AND TO A CONSIDERABLE EXTENT A SEPARATE ACTIVITY.
- o WE CONCLUDE THAT THERE ARE NUMEROUS FEATURES WHICH ARE HIGHLY ATTRACTIVE TO RESPONDENTS AND WHICH ARE NOT CURRENTLY IN USE. EFFECTIVE IMPLEMENTATION OF THESE FEATURES WOULD PROVIDE GTEDS WITH SUBSTANTIAL SERVICE DIFFERENTIATION AND COMPETITIVE ADVANTAGE.

**INPUT**



### MANDATORY SYSTEM FEATURES

- o OF THE FEATURES TESTED, CERTAIN ONES APPEAR AS "MANDATORY" FOR A SUCCESSFUL OFFERING SINCE THEY HAVE HIGH CURRENT/FUTURE IMPORTANCE AND ARE IN CURRENT USE BY LARGE PROPORTIONS OF THE RESPONDENTS. EXCLUSION OF ANY SINGLE FEATURE OR GROUP OF FEATURES COULD RESULT IN REJECTION OF A GTEDS OFFERING NOW OR IN THE FUTURE, HENCE THE DESCRIPTION OF "MANDATORY."

<u>FEATURE</u>	<u>% USE NOW</u>	<u>RATING NOW</u>	<u>RATING 3 YRS</u>
AVAILABLE # INVENT.	75.4	4.0	4.4
INDIV. CO. ROAMER	68.9	4.1	4.4
O.L. ACCOUNT INQUIRY	68.9	4.7	4.9
O.L. ORDER ENTIRY	67.2	4.6	4.7
TREATMENT PROCESS	63.9	4.1	4.5
O.L. PAYMENT HIST	62.3	4.4	4.6
M/F BASED BILLING	55.7	3.6	3.9
VENDOR SYS. TABLE	42.6	3.5	4.0
DEPOSIT ACTTNG.	41.0	3.5	4.0
3 DAY BILL MAIL	39.3	4.4	4.6
NETWORK REDUNDANCY	39.3	3.8	4.1

**INPUT**





### SYSTEM FEATURES (cont'd)

- o OF THE FEATURES TESTED, CERTAIN ONES APPEAR AS "MANDATORY" FOR A SUCCESSFUL OFFERING SINCE THEY HAVE HIGH CURRENT/FUTURE IMPORTANCE AND ARE IN CURRENT USE BY LARGE PROPORTIONS OF THE RESPONDENTS. EXCLUSION OF ANY SINGLE FEATURE OR GROUP OF FEATURES COULD RESULT IN REJECTION OF A GTEDS OFFERING NOW OR IN THE FUTURE, HENCE THE DESCRIPTION OF "MANDATORY."

<u>FEATURE</u>	<u>% USE NOW</u>	<u>RATING NOW</u>	<u>RATING 3 YRS</u>
AVAILABLE # INVENT.	75.4	4.0	4.4
INDIV. CO. ROAMER	68.9	4.1	4.4
O.L. ACCOUNT INQUIRY	68.9	4.7	4.9
O.L. ORDER ENTIRY	67.2	4.6	4.7
TREATMENT PROCESS	63.9	4.1	4.5
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M/F BASED BILLING	55.7	3.6	3.9
VENDOR SYS. TABLE	42.6	3.5	4.0
DEPOSIT ACTTNG.	41.0	3.5	4.0
3 DAY BILL MAIL	39.3	4.4	4.6
NETWORK REDUNDANCY	39.3	3.8	4.1

**INPUT**



### SYSTEM FEATURES (cont'd)

- o THESE FEATURES HAVE HIGH CURRENT USE (MOST MAJORITY USE) AND HIGH CURRENT IMPORTANCE. ALTHOUGH ALL INCREASE IN IMPORTANCE, THE INCREASES ARE NOT STATISTICALLY SIGNIFICANT AT THE 90% LEVEL.
- o THE DATA ARE RANKED BY FREQUENCY OF OCCURENCE OF THE FEATURE. TO DIFFERENTIATE THE IMPORTANCE OF A FEATURE 0.6 POINTS IS REQUIRED BETWEEN THE RATINGS. ACCORDINGLY VENDOR SYSTEM TABLES (NOW) IS SIGNIFICANTLY LESS IMPORTANT (STATISTICALLY, AT THE 90% CONFIDENCE INTERVAL) THAN TREATMENT PROCESSING (3.5 vs. 4.1) BUT IS NOT SIGNIFICANTLY DIFFERENT (MORE IMPORTANT) THAN AVAILABLE # INVENTORY 4.0).
- o WHILE CONSIDERING RELATIVE IMPORTANCE ON THIS LIST MAY BE USEFUL FOR SOME PURPOSES, IT SHOULD BE RECOLLECTED THAT THE UBIQUITY OF THESE FEATURES MAKES THEM MANDATORY FOR MARKET PARTICIPATION IN A MEANINGFUL WAY.

**INPUT**



### SYSTEM FEATURES (cont'd)

- o STATISTICALLY SIGNIFICANTLY LESS IMPORTANT ARE MANAGEMENT REPORTS, DOCUMENTATION, TRAINING AND - INTERESTINGLY - PRICE.
- o SYSTEM RELIABILITY AND ON-LINE RELIABILITY ARE SOME WHAT LESS OF A PROBLEM AS INDICATED BY THE DIFFERENTIAL. NOTE THAT 62% OF R'S GIVE SYSTEM RELIABILITY A RATING OF 4/5. O.L. RELIABILITY, WHILE ACHIEVING THE SAME MEAN RATING (4.7) EXHIBITS LOWER SATISFACTION WITH 46% RATING 4 OR 5.
- o RERUNS AND TECHNICAL ASSISTANCE SHOW A DIFFERENTIAL SIMILAR TO SYSTEM RELIABILITY BUT OBSERVE THAT ONLY 30% RATE RERUN PERFORMANCE A 4/5. THIS IS APPARANTLY A PROBLEM AREA FOR SOME R'S.
- o TECHNICAL ASSISTANCE, ALTHOUGH AT THE SAME 1.2 DIFFERENTIAL, RATES 4/5 BY ABOUT HALF THE R'S WHILE 93% RATE IT 4/5 ON IMPORTANCE. FOR SOME R'S THIS COULD BE A POWERFUL SELLING POINT.

**INPUT**



**SYSTEM FEATURES** (cont'd)

- o MORE MODERATE (BUT STILL STATISTICALLY SIGNIFICANT DIFFERENTIALS ARE SHOWN BY THE BALANCE OF THE ITEMS. UPDATE FLEXIBILITY, EASE OF USE, BILL APPEARANCE AND CUSTOM PROGRAMMING FALL INTO THIS "LESS OF PROBLEM (BUT STILL A PROBLEM)" CATEGORY.

**INPUT**





### SYSTEM FEATURES, INDIFFERENT

- o A FINAL CLASS OF FEATURES ARE THOSE TO WHICH RESPONDENTS WERE INDIFFERENT OR SLIGHTLY NEGATIVE. THESE MAY BE SAFELY IGNORED IN PRODUCT DEVELOPMENT AND MARKETING ACTIVITIES (SHOULD THEY OCCUR).

<u>FEATURE</u>	<u>% USE NOW</u>	<u>RATING NOW</u>	<u>RATING 3 YRS</u>
USER MAINT. SYS TABLES	29.5	3.5	3.6
MICRO/M.F. COMBO	26.2	3.2	3.5
LOWER O.L. COSTS	19.7	4.1	4.3
MICRO-BASED BILLING	18.1	2.6	2.9
LOCAL BILL PROCESSING	16.4	2.8	3.2
REMOTE ACTIVATION	6.6	1.8	2.3

**INPUT**



**SYSTEM FEATURES** (cont'd)

- o ITEMS ARE ORDERED BY PROPORTION CURRENTLY CLAIMING USE.
- o OBSERVE THAT NO FEATURE INCREASES IN IMPORTANCE IN A STATISTICALLY SIGNIFICANT WAY.
- o DEMAND FOR USER-MAINTAINED SYSTEM TABLES AND COMBINED MICRO-MAINFRAME PROCESSING IS MODERATE AND CONSTANT. THESE TWO FEATURES ARE "MARGINAL" IN THAT THEY FALL ON THE BOUNDARY BETWEEN "DESIRABILITY" AND "INDIFFERENCE" IN THE MINDS OF RESPONDENTS. IF TECHNICALLY APPROPRIATE, THEY MIGHT BE INCLUDED IN THE DEVELOPMENT AGENDA OR SERVICE CONFIGURATION BUT THEY ARE WEAKER THAN THE FIRST TWO CATEGORIES.

**INPUT**



**SYSTEM FEATURES** (cont'd)

- o LOWER ON-LINE COSTS RECEIVED AN "APPLE-PIE" RESPONSE, AN "OF-COURSE" BY STUDY PARTICIPANTS. INFORMAL COMMENTS BY RESPONDENTS LEADS INPUT TO BELIEVE THIS IS NOT A DECISIVE FACTOR DESPITE ITS RATINGS. THIS IS APPARENTLY IN CONFLICT WITH THE STRONG DESIRE FOR NETWORK REDUNDANCY WHICH IS MUCH MORE IMPORTANT.
- o MICRO-BASED BILLING DOES NOT APPEAL VERY STRONGLY TO RESPONDENTS. APPARENTLY THIS GROUP BELIEVES THAT BILLING SYSTEMS MUST BE MAINFRAME-BASED. THIS IS A POSITIVE FOR GTEDS GIVEN ITS CURRENT DIRECTION.

**INPUT**



### SYSTEM FEATURES (cont'd)

- o LOCAL BILL PROCESSING WAS NOT DEEMED VERY NECESSARY BY RESPONDENTS. THE "INDIFFERENT" RATING INDICATES THAT GTEDS MAY PROCESS LOCALLY IF DESIRABLE FROM AN OPERATIONAL OR ECONOMIC STANDPOINT BUT THAT SUCH PROCESSING WILL NOT BE OF GREAT IMPORTANCE TO RESPONDENTS. THIS SHOULD BE SOLD AS "BACK-UP" MULTI-SITE AS OPPOSED TO LOCAL PROCESSING TO WHICH RESPONDENTS ARE LARGELY INDIFFERENT.
- o OBSERVE THAT RESPONDENTS RESPOND NEGATIVELY TO REMOTE SWITCH ACTIVATION. THIS IS NOT A DESIRABLE FEATURE.
- o INPUT BELIEVES THAT THESE SIX FEATURES MAY BE SAFELY IGNORED FOR THE VAST MAJORITY OF RESPONDENTS.

**INPUT**





### COMPETITIVE PROCESSING

- o RESPONDENTS WERE QUERIED AS TO WHETHER OR NOT IT WAS IMPORTANT IF THEIR PROCESSING WAS ACCOMPLISHED BY A WIRELINE COMPANY IF NON-WIRELINE AND VICE VERSA, DEPENDING ON THEIR STATUS.
- o OF THE NON-WIRELINE RESPONDENTS 11% INDICATED THAT THEIR PROCESSING WAS CURRENTLY ACCOMPLISHED BY A WIRELINE COMPANY. NO WIRELINES SO INDICATED.
- o NON-WIRELINES DID NOT CONSIDER THIS AN IMPORTANT FACTOR, RATING ITS IMPORTANCE AT 2.2 NOW AND 2.0 IN THE FUTURE. THE DIFFERENCE IS NOT STATISTICALLY SIGNIFICANT BETWEEN NOW AND 3 YEARS HENCE.

IMPORTANCE RATE	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>% 4/5</u>
% NOW	54	8	17	4	17	21
% 3 YEARS	56	9	13	13	9	22

**INPUT**



COMPETITIVE PROCESSING (cont'd)

- o AS THE DATA SHOW, OVER HALF THE R'S CONSIDER WIRELINE PROCESSING SOURCE (AS NON-WIRELINES) UNIMPORTANT, I.E., RATE IT A "1."
- o A MATERIAL MINORITY - ABOUT 1 IN 5 - CONSIDER THIS AN IMPORTANT ISSUE. THIS PROPORTION IS STABLE OVER TIME.
- o EMPHASIS ON SECURITY, DATA INTEGRITY AND CONFIDENTIALITY MAY AMELIORATE THE FEARS OF THE MINORITY OF R'S WITH THIS CONCERN, BUT THIS IS BY NO MEANS GUARANTEED.
- o ON BALANCE THIS DATA MAY BE CONSIDERED A POSITIVE SINCE NEARLY 2/3 OF NON-WIRELINES CONSIDER THIS AN UNIMPORTANT FACTOR, RATING IT EITHER A "1 OR 2." ON THE OTHER HAND A MATERIAL MINORITY CONSIDER IT VERY IMPORTANT.

**INPUT**



**COMPETITIVE PROCESSING** (cont'd)

- o SHOULD MARKETING ACTIVITY COMMENCE, INPUT RECOMMENDS A PRO-ACTIVE APPROACH EMPHASIZING SECURITY, ETC., RATHER THAN AN ATTEMPT TO SKIRT THE ISSUE. ASSURANCES OF THIS TYPE WILL NOT DAMAGE THE GTEDS CASE WITH THOSE INSENTITIVE TO THE "COMPETITIVE" ISSUE BUT MAY REDUCE ANXIETY ON THE PART OF THOSE 20-22% CONCERNED WITH IT.
- o THE WIRELINES RESPONDED IN A SIMILAR FASHION. THIS INDICATES THAT THERE IS NOT A STRONG COMPETITIVE COMPONENT IN THE PROCESSING AREA. GIVEN THAT MARKETS ARE ASSIGNED AND THAT THERE ARE ONLY TWO COMPETITORS PER MARKET (VERY LIMITED DIRECT COMPETITION) THIS IS UNDERSTANDABLE.

**INPUT**



### SERVICE QUALITY

- RESPONDENTS WERE QUERIED ON 16 ITEMS RELATED TO SERVICE QUALITY. THESE COVERED A WIDE RANGE AND ARE NOTABLE FOR THE GENERALLY MODERATE RATINGS. ON THE SCALE USER "ONE" REPRESENTED POOR QUALITY WHILE "FIVE" REPRESENTED EXCELLENT QUALITY.
- IN ADDITION TO QUALITY RATINGS, RESPONDENTS WERE ASKED TO RATE THE IMPORTANCE OF EACH OF THE 16 SERVICE QUALITY ITEMS. THE DIFFERENTIAL BETWEEN THESE TWO IS A MEASURE OF SERVICE INADEQUACY, I.E. THE GREATER THE DIFFERENTIAL, THE LESS SATISFACTORY THE SERVICE LEVEL RELATIVE TO THE PERCEIVED REQUIREMENT.

**INPUT**





### SERVICE QUALITY RANKINGS

<u>SERVICE ITEM</u>	<u>QUALITY RATING</u>	<u>% 4/5</u>	<u>IMPORTANCE RATING</u>	<u>% 4/5</u>	<u>RATING DIFF.</u>
BILL ACCURACY	3.5	46	5.0	100	1.5
O/A QUALITY	3.4	44	4.9	98	1.5
BILL TIMELINESS	3.5	51	4.9	94	1.4
MGMT. REPORTS	3.3	39	4.7	90	1.4
DOCUMENTATION	3.1	31	4.5	80	1.4
TRAINING	3.2	41	4.5	88	1.3
PRICE	3.2	21	4.5	67	1.3
RELIABILITY, M.F.	3.7	62	4.9	98	1.2
TECH. ASSIST.	3.4	51	4.6	93	1.2
RERUNS	3.3	30	4.5	67	1.2
RELIABILITY, O.L.	3.7	46	4.8	77	1.1
UPDATE FLEX.	3.7	54	4.7	83	1.0
USE EASE	3.6	54	4.6	92	1.0
BILL APPEAR.	3.7	57	4.6	92	0.9
CUST. PGM.	3.6	54	4.5	82	0.9
CONTRACT	3.6	34	4.2	49	0.6

**INPUT**



**SERVICE QUALITY RANKINGS** (cont'd)

- o THESE DATA ARE RANKED BY THE DIFFERENCE BETWEEN QUALITY AND IMPORTANCE RATINGS. ALL DIFFERENCES ARE STATISTICALLY SIGNIFICANT AT THE 90% CONFIDENCE INTERVAL BETWEEN QUALITY AND IMPORTANCE. THIS INDICATES A SUBSTANTIAL GAP BETWEEN SERVICE LEVELS DELIVERED AND DESIRED, A MOST SERIOUS CIRCUMSTANCE AND A POOR REFLECTION ON VENDORS.
- o DATA INDICATES THAT BILL ACCURACY, OVERALL SERVICE QUALITY AND BILL TIMELINESS ARE HIGHLY IMPORTANT AND SHOW THE GREATEST DEFICIENCIES.
- o CONTRACTUAL TERMS BRING UP THE BOTTOM OF THE LIST. NOTE PARTICULARLY THE SLIM MARGIN IN THE 4/5 RATINGS AT 34% VS. 49%. THIS IS THE AREA OF LEAST DIFFERENTIAL AND DOES NOT RECOMMEND ITSELF AS A KEY DIFFERENTIATOR.

**INPUT**



SERVICE QUALITY RANKINGS (cont'd)

- o THE MEAN PROPORTION RATING 4/5 ON SERVICE QUALITY (GOOD/EXCELLENT) IS 44.7%. PRICE, RERUNS, DOCUMENTATION AND CONTRACT PROPORTIONS ARE WELL BELOW THIS AVERAGE WHILE M.F. RELIABILITY AND BILL APPEARANCE ARE WELL ABOVE. WITH RESPECT TO THE MEAN, THESE CAN BE CONSIDERED TO HAVE THE LOWEST RELATIVE SATISFACTION INDEPENDENT OF IMPORTANCE.
- o BILL ACCURACY, OVERALL QUALITY AND TIMELINESS HAVE THE HIGHEST DEVIATION FROM THE MEAN PROPORTION OF "HIGH IMPORTANCE" VALUE OF 82.5%. LOWEST IS CONTRACT TERMS FOLLOWED BY RERUNS AND PRICE.

**INPUT**



**SERVICE QUALITY RANKINGS** (cont'd)

- o THIS DATA LEAVES LITTLE DOUBT THAT SERVICE QUALITY AS DELIVERED CAN BE IMPROVED OVERALL. IF THE PROBLEMS SEEN ARE NOT RESPONDENT - CAUSED OR ENDEMIC (PERHAPS BECAUSE OF VOLATILITY AND RAPID GROWTH), THEN GTEDS APPEARS TO HAVE AN OPPORTUNITY AND A CHALLENGE BEFORE IT: THE DEVELOPMENT OF A CELLULAR BILL PROCESSING SERVICE THAT ALIGNS ITS DELIVERY WITH USER NEEDS. SUCH A SERVICE SHOULD BE SUCESSFUL.

**INPUT**





### SERVICE PRICING

- o RESPONDENTS WERE ASKED TO RATE PRICES FOR A SERVICE WHICH MET THEIR NEEDS PROFILE ON A COST PER BILL BASIS. COSTS WERE STATED TO INCLUDE ALL ITEMS EXCEPT POSTAGE. ON THE 1-5 SCALE "ONE" REPRESENTED POOR VALUE WHILE "FIVE" REPRESENTED EXCELLENT VALUE.

<u>\$ PER BILL</u>	<u>% 1</u>	<u>% 2</u>	<u>% 3</u>	<u>% 4</u>	<u>% 5</u>	<u>% 4/5</u>	<u>MEAN</u>
5.00	48	34	14	2	2	4	1.8
3.50	10	29	38	17	6	23	2.8
2.50	2	7	33	37	21	58	3.7
1.75	2	2	5	36	55	91	4.4
1.25	0	2	5	12	81	93	4.7

- o OBSERVE THAT R'S ARE OVERWHELMINGLY NEGATIVE AT \$5.00/BILL WITH 82% OF RESPONSES A 1 OR 2.

**INPUT**



### SERVICE PRICING

- o AT A 30% REDUCTION TO \$3.50 THE DISTRIBUTION TAKES ON A RELATIVELY NORMAL SHAPE WITH SOME NEGATIVE SKEWNESS. WITH CREDIBLY SUPERB SERVICE A BILL PROCESSING BUSINESS MAY BE VIABLE AT \$3.50. 30% OF R'S ARE NEGATIVE WHILE 23% ARE POSITIVE.
- o AT ANOTHER 30% REDUCTION (APPROX.) TO \$2.50, THE DISTRIBUTION SHOWS VERY SUBSTANTIAL POSITIVE SKEWNESS WITH 58% POSITIVE AND ONLY 9% NEGATIVE. A STRONG CENTER STILL EXISTS AT 3, PULLING DOWN THE MEAN RATING.
- o AT \$1.75, THE DISTRIBUTION BECOMES OVERWHELMINGLY POSITIVE WITH 91% RATING 4/5 AND ONLY 4% NEGATIVE. THE CENTER ALSO EVAPORATES. THE MEAN RISES TO 4.4
- o DESCENDING ANOTHER 30% (APPROX.) HAS ONLY A MINOR EFFECT ON THE DISTRIBUTION MEAN, PUSHING IT TO 4.7. RESPONSES ARE NOW CONCENTRATED HEAVILY AT "5."

**INPUT**



**SERVICE PRICING** (cont'd)

- o THE DIFFERENCES BETWEEN MEANS ARE STATISTICALLY SIGNIFICANT AT THE 90% LEVEL AT ALL PRICE POINT INTERVALS EXCEPT \$1.75 TO \$1.25. THIS CONFIRMS THAT THE DIFFERENCES ARE MEANINGFUL.
- o THIS DATA SUGGESTS THAT A HIGHLY VIABLE PRICE POINT IS IN THE RANGE OF \$2.50/BILL. IT MIGHT BE INFERRED FROM THE RESPONSES THAT THE AVERAGE CURRENTLY PAID IS SOMEWHAT HIGHER THAN \$2.50 BUT LESS THAN \$3.50.

**INPUT**



### PRICE ELASTICITY

- o BY MULTIPLYING THE PRICE POINT BY THE PROPORTION INDICATING 4/5 (ABOVE AVERAGE VALUE) WE CAN DOCUMENT THE PRICE ELASTICITY OF THE SERVICE.

<u>PRICE</u>	<u>% 4/5</u>	<u>PRODUCT</u>	<u>PROD. % CHG.</u>
\$ 5.00	4	20.0	-
\$ 3.50	23	90.5	302.5
\$ 2.50	58	145.0	80.1
\$ 1.75	91	159.2	9.8
\$ 1.25	93	116.25	-27.0

- o THE PRODUCT MAY CONSIDERED AS A PROXY FOR "TOTAL DOLLARS AVAILABLE" AT A PRICE POINT.
- o THE DATA SHOWS THAT AFTER REACHING THE "PLAUSIBLE" PRICE OF \$3.50/BILL, SUBSTANTIAL INCREASES IN TOTAL MARKET ARE AVAILABLE TO \$2.50/ BILL. IN THIS \$1.00 RANGE MARKET SHARE (AND TOTAL DOLLARS) WOULD BE VERY SENSITIVE TO PRICE. A 28.6% DROP IN PRICE FROM \$3.50 TO \$2.50 RESULTS IN AN 80% INCREASE IN PRODUCT.

**INPUT**





**PRICE ELASTICITY** (cont'd)

- o A FURTHER DROP (30%) TO \$1.75 RESULTS IN ONLY A 9.8% INCREASE IN PRODUCT. A VERY AGGRESSIVE MARKET SHARE-ORIENTED CAMPAIGN WOULD PRICE BELOW \$2.50 BUT ABOVE \$1.75.
- o AT \$1.25 THERE IS NO FURTHER PRICE ELASTICITY AS PRODUCT DROPS ALMOST EQUALLY TO PRICE.
- o GIVEN THAT THE PRIOR DATA SHOWS PRICE TO BE OF ABOVE AVERAGE IMPORTANCE TO 67% OF R'S (LESS THAN OTHER FACTORS), INPUT WOULD RECOMMEND A PRICE IN THE VICINITY OF \$2.50/BILL TO OPTIMIZE TOTAL REVENUES AVAILABLE IF PROCESSING ECONOMICS PERMIT.
- o REDUCTIONS BELOW \$2.50 RESULT IN ONLY MODEST PRODUCT (TOTAL REVENUE) GAINS WHILE PRICES ABOVE \$2.50 ARE MUCH MORE SENSITIVE. A PRICE OF \$2.75 (+10%) WOULD RESULT IN A 14% REDUCTION IN PRODUCT FOR EXAMPLE.

**INPUT**



**PRICE ELASTICITY** (cont'd)

- o AN AGGRESSIVE, "SHARE-SIEZING" STRATEGY WOULD SET THE PRICE BELOW \$2.50 BY A MODEST AMOUNT (5-10%). THIS COULD SUBSEQUENTLY BE RAISED AFTER SHARE WAS OBTAINED.
- o WHILE MOBILNET ECONOMICS AND VOLUMES MIGHT ALTER THE PRACTICAL SCENARIO, WE WOULD EXPECT GOOD TO EXCELLENT MARKET RESPONSE IN THE RANGE OF \$2.75 TO \$2.40 PER BILL ON THE BASIS OF THIS DATA UNDER A TOTAL REVENUE PRIMARY CRITERION. WE WOULD FURTHER EXPECT THAT THE SERVICE WOULD BECOME LESS VIABLE BEYOND \$3.00 PER BILL.
- o A FURTHER CONSIDERATION IS THE CONVERSION OR "DISRUPTION" PREMIUM. UNTIL GTEDS ESTABLISHES A TRACK RECORD FOR SUPERIOR SERVICE, CLIENTS WILL PERCEIVE THAT THEY ARE TAKING A RISK. IN RETURN FOR ACCEPTING THIS RISK THEY WOULD EXPECT AN ECONOMIC GAIN. THIS ARGUES FOR LOWER PRICES IF POSSIBLE.

**INPUT**



### ROAMER PRICING

- o WHILE THIS STUDY DID NOT FOCUS HEAVILY ON THE ROAMER ISSUE WHICH IS EXTREMELY COMPLEX AND MAY WARRANT ITS OWN STUDY SHOULD GTEDS ELECT ENTRY INTO THE CELLULAR BILLING MARKET, DATA WAS GATHERED ON "FAIR" AND "EXCELLENT" ROAMER PRICING.
- o R'S WERE ASKED TO SPECIFY A PRICE POINT REPRESENTING A "FAIR" ROAMER PRICE PER BILL WHEN BILLED THROUGH A CLEARING HOUSE. NEXT, THEY WERE ASKED TO SPECIFY A ROAMER PRICE REPRESENTING EXCELLENT VALUE.
- o 46% OF R'S WERE ABLE TO RESPOND TO THIS QUESTION. AT SLIGHTLY LESS THAN HALF OF ALL RESPONDENTS, DATA ON THIS QUESTION SHOULD BE USED WITH CAUTION AS THE MAJORITY WERE UNABLE TO PROJECT A PRICE POINT.
- o NEGLECTING ONE HIGH OUTLIER, R'S INDICATED A MEAN FAIR PRICE PER ROAMER "BILL" CLEARED AT \$0.19 PER BILL FOR A FAIR PRICE AND \$0.14 FOR AN EXCELLENT PRICE.

**INPUT**



**ROAMER PRICING** (cont'd)

- o RESPONSES RANGED FROM AS LOW A \$0.02 FOR "FAIR" TO AS HIGH AS \$1.50 IN ONE CASE. RANGE WAS FROM \$0.02 (AGAIN) AS "EXCELLENT" TO A HIGH OF \$0.50.
- o GIVEN THE WIDE VARIATION IN RESPONSES, WE CONSIDER THIS LIMITED DATA AS USABLE ONLY WITH GREAT CAUTION. WE SUSPECT THAT R'S MAY HAVE RESPONDED PER CALL IN SOME CASES RATHER THAN THE REQUESTED PER BILL.
- o ASSUMING THE DATA "REALLY" MEANS PER CALL, WE WOULD CONCLUDE THAT 20¢ WOULD BE CONSIDER AS AN AVERAGE "FAIR" PRICE ACCEPTABLE TO MOST RESPONDENTS.

**INPUT**





## CONCLUSION

- o ON BALANCE, THIS MARKET APPEARS TO HAVE MERIT. IT IS:
  - EXPECTED TO GROW RAPIDLY.
  - CURRENT SERVICE IS INDIFFERENT TO POOR.
  - MANY USER WOULD CONSIDER CHANGING VENDORS.
  - CURRENT SYSTEMS LACK FEATURES WHICH ARE IMPORTANT TO USERS.
  - DIFFENTIATION IS POSSIBLE.
  - PRICING REQUIREMENTS APPEAR REASONABLE.
  - SERVICE QUALITY IS MORE IMPORTANT THAN PRICE.
  - MANDATORY FEATURES ARE PLAUSIBLE.
  - MAINFRAME PROCESSING IS DESIRABLE.
- o THE PRIMARY OFFSET IS THE RELATIVELY SMALL MARKET SIZE, I.E. \$33 MILLION IN 1989 AT \$2.50/BILL.

**INPUT**



**CONCLUSION** (cont'd)

- o THERE IS A SUBSTANTIAL PROBABILITY THAT AT LEAST ONE COMPETITOR (BANK ILL.) WILL NOT BE A PARTICIPANT IN THE FUTURE. INPUT WOULD NOT BE SURPRISED BY OTHER MARKET CHANGES AS WELL. AMONG THE POSSIBILITIES ARE AN "EVACUATION" BY AUXTON (THROUGH THE MECHANISM OF SOFTWARE SALES FOR INHOUSE PROCESSING) AND A FAILURE OF CINCINNATI BELL/CBSI TO EFFECTIVELY INTEGRATE THEIR SEPARATE SYSTEMS. IN THE MAIN, THE COMPETITORS ARE FINANCIALLY WEAK OR ORGANIZATIONALLY FLAWED OR BOTH.
- o ACCORDINGLY, THERE IS AN OPPORTUNITY FOR A STABLE, PROPERLY MANAGED SERVICE TO FARE WELL IN THIS MARKET.

**INPUT**



### CONCLUSION (cont'd)

- o IF THE MARKET CONTINUES TO GROW WELL BEYOND THE FORECAST HORIZON AND IF A MAJOR SHARE CAN BE COMMANDED, THEN SUBSTANTIAL INVESTMENT COULD BE WARRANTED. THE VOLATILITY OF THIS MARKET MAKES EXTRAPOLATION TO THE FIVE YEAR HORIZON VERY RISKY. IF RATES EXPECTED IN THE 3 YEAR INTERVAL ARE EXTRAPOLATED TO 5 YEARS A \$75 MILLION MARKET EMERGES WITH ABOUT 2.5 MILLION PHONES AT \$2.50 BILL/MONTH. THIS IS A SUBSTANTIAL "SPECIALTY" MARKET BUT MATERIAL REVENUES WOULD REQUIRE A COMMANDING SHARE.
- o A MORE CONSERVATIVE APPROACH IS RECOMMENDED FOR THOSE NOT WISHING TO "BET" ON THE FUTURE GROWTH CONTINUING AT VERY HIGH RATES. PARTICIPATION WOULD BE BASED ON MODERATE INCREMENTAL INVESTMENT (FIRST IN MEETING FEATURES NEEDS, THEN IN MARKETING WORK) BEYOND THAT NEEDED FOR MOBILNET. BASED ON THE AVAILABLE DATA, THERE IS ONLY LIMITED RISK IN THIS APPROACH PROVIDED IT IS ACCOMPANIED BY RIGOROUS FINANCIAL ANALYSIS AND A THOROUGHLY DEVELOPED STEP-BY-STEP PLAN.

**INPUT**



**INTRODUCTION** (cont'd)

- o IN SUM, THERE IS AN OPPORTUNITY HERE WITH "GOOD FIT" TO GTEDS INTERNAL PLANS AND NEEDS. THE SCALE OF INVESTMENT IS MODERATELY PROBLEMATIC BUT CAN BE "SOLVED" THROUGH APPROPRIATE ANALYSIS AND CALIBRATION OF RISK. OVERALL, INPUT'S VIEW OF THIS MARKET IS POSITIVE.

**INPUT**

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THANK YOU

PACKAGE

CELLULAR



December 5, 1986

Ms. Marlyn Murdock  
SW Bell Mobile  
17330 Preston Road  
Dallas, Texas 75252

Dear Ms. Murdock:

You recently participated in a study on "Cellular Billing Services."

As a way of extending our thanks for your participation, we have enclosed an executive summary of that study for your reference.

Again, thank you for taking time to help us with our research. We appreciate your cooperation.

Sincerely,

Betty Ann Van Benschoten  
Senior Analyst

BAVB/jh  
Enclosure



CELLULAR BILLING SERVICES

EXECUTIVE SUMMARY

INPUT  
Parsippany Corporate Center  
Suite 201  
959 Route 46 East  
Parsippany, New Jersey 07054  
(201) 299-6999

INPUT



## INTRODUCTION

- o RECENTLY, A STUDY OF CELLULAR BILLING SERVICES WAS COMMISSIONED WITH INPUT BY A MAJOR CORPORATION
- o A TELEPHONE SURVEY QUESTIONNAIRE WAS DEVELOPED AND ADMINISTERED TO 61 WIRELINE AND NON-WIRELINE OPERATORS OF CELLULAR SERVICES IN THE TOP 90 MARKETS.
- o DATA WAS GATHERED ON A WIDE RANGE OF REVELANT ITEMS INCLUDING:
  - CURRENT PROCESSING SOURCE
  - SERVICE FEATURES USED
  - SERVICE FEATURES DESIRED
  - EXPECTED GROWTH
  - SATISFACTION WITH SERVICE
  - PRICING

**INPUT**





**INTRODUCTION** (cont'd)

- o OF THE 61 COMPANIES INTERVIEWED 27.9% (17) WERE WIRELINES WHILE 72.1% WERE NON-WIRELINES.
- o WITH WIRELINES, IT IS IMPORTANT TO NOTE THAT BILLING IS HIGHLY CENTRALIZED AND CONSOLIDATED. THESE ARE "SINGLE LOCATION" BILLERS. OFTEN THEY HAVE LONG-STANDING BILLING RELATIONSHIPS.

**INPUT**



### SYSTEM FEATURES

- o EXTENSIVE DATA WAS GATHERED BY INPUT ON SYSTEM FEATURES AND THEIR USE. ALSO GATHERED WAS DATA ON THE IMPORTANCE OF THESE FEATURES AT THE PRESENT TIME AND THREE YEARS IN THE FUTURE.
- o A TOTAL OF 30 SYSTEM FEATURES WAS TESTED.
- o RESPONDENTS WERE ASKED WHETHER OR NOT THEIR CURRENT SYSTEM PROVIDED THE CAPABILITY. THEY WERE THEN QUERIED AS TO HOW IMPORTANT THE FEATURE WAS (OR WOULD BE) IN THEIR OPERATIONS.
- o IMPORTANCE - BOTH CURRENT AND FUTURE - WAS RATED ON A ONE TO FIVE (1-5) SCALE WITH "1" DESIGNATED AS UNIMPORTANT" AND "5" DESIGNATED AS "VERY IMPORTANT."



### SYSTEM FEATURES (cont'd)

- o FEATURE RATINGS VARIED BETWEEN 1.8 TO 4.9. THE RANGE OF VARIATION INDICATES THAT THE DIFFERENCE BETWEEN FEATURES IS MEANINGFUL TO RESPONDENTS.
- o SUBSTANTIAL VARIATION WAS ALSO OBSERVED IN THE PROPORTION EMPLOYING THE FEATURES. PROPORTION WITH A SPECIFIC FEATURE RANGED FROM 6.6% TO 75.4%.
- o OF THOSE FEATURES TESTED, 40% INCREASED IN IMPORTANCE NOW VERSUS 3 YEARS IN THE FUTURE IN A STATISTICALLY SIGNIFICANT WAY I.E., 90% CONFIDENCE INTERVAL. THEY ARE PRESENTED IN THE TABLE.



**SYSTEM FEATURES** (cont'd)

**SIGNIFICANT CHANGE FEATURES**

<u>FEATURE</u>	<u>% USE NOW</u>	<u>RATING NOW</u>	<u>RATING 3 YRS</u>	<u>DELTA</u>
AUTO INTERFACE	24.6	4.1	4.7	.6
CENTRAL SWITCH MGMT.	55.7	4.0	4.6	.6
SINGLE CLEAR ROAMERS	13.1	4.0	4.6	.6
ELEC. DATA XFER.	11.5	3.3	4.4	1.1
ROAMER RCVABL.	9.8	3.8	4.3	.5
LOCK BOX	47.5	3.5	4.2	.7
MULTI-SITE BACKUP	27.9	3.6	4.2	.6
MULTIPLE BILL CYCLES	29.5	2.6	3.7	1.1
BILL ON DEMAND	8.2	2.7	3.7	1.0
BALANCE CYCLE LOADS	23.0	2.8	3.6	.8
LASER PRINTING	16.4	2.8	3.5	.7
REMOTE ACCT. INIT.	13.1	2.3	2.1	.8

- o RANKING IS BY HIGH FUTURE IMPORTANCE.

**INPUT**





### SERVICE QUALITY

- o RESPONDENTS WERE QUERIED ON 16 ITEMS RELATED TO SERVICE QUALITY. THESE COVERED A WIDE RANGE AND ARE NOTABLE FOR THE GENERALLY MODERATE RATINGS. ON THE SCALE USER "ONE" REPRESENTED POOR QUALITY WHILE "FIVE" REPRESENTED EXCELLENT QUALITY.
- o IN ADDITION TO QUALITY RATINGS, RESPONDENTS WERE ASKED TO RATE THE IMPORTANCE OF EACH OF THE 16 SERVICE QUALITY ITEMS. THE DIFFERENTIAL BETWEEN THESE TWO IS A MEASURE OF SERVICE INADEQUACY, I.E. THE GREATER THE DIFFERENTIAL, THE LESS SATISFACTORY THE SERVICE LEVEL RELATIVE TO THE PERCEIVED REQUIREMENT.



### SERVICE QUALITY RANKINGS

<u>SERVICE ITEM</u>	<u>QUALITY RATING</u>	<u>% 4/5</u>	<u>IMPORTANCE RATING</u>	<u>% 4/5</u>	<u>RATING DIFF.</u>
BILL ACCURACY	3.5	46	5.0	100	1.5
O/A QUALITY	3.4	44	4.9	98	1.5
BILL TIMELINESS	3.5	51	4.9	94	1.4
MGMT. REPORTS	3.3	39	4.7	90	1.4
DOCUMENTATION	3.1	31	4.5	80	1.4
TRAINING	3.2	41	4.5	88	1.3
PRICE	3.2	21	4.5	67	1.3
RELIABILITY, M.F.	3.7	62	4.9	98	1.2
TECH. ASSIST.	3.4	51	4.6	93	1.2
RERUNS	3.3	30	4.5	67	1.2
RELIABILITY, O.L.	3.7	46	4.8	77	1.1
UPDATE FLEX.	3.7	54	4.7	83	1.0
USE EASE	3.6	54	4.6	92	1.0
BILL APPEAR.	3.7	57	4.6	92	0.9
CUST. PGM.	3.6	54	4.5	82	0.9
CONTRACT	3.6	34	4.2	49	0.6

**INPUT**



### SERVICE QUALITY RANKINGS (cont'd)

- o THESE DATA ARE RANKED BY THE DIFFERENCE BETWEEN QUALITY AND IMPORTANCE RATINGS. ALL DIFFERENCES ARE STATISTICALLY SIGNIFICANT AT THE 90% CONFIDENCE INTERVAL BETWEEN QUALITY AND IMPORTANCE. THIS INDICATES A SUBSTANTIAL GAP BETWEEN SERVICE LEVELS DELIVERED AND DESIRED, A MOST SERIOUS CIRCUMSTANCE AND A POOR REFLECTION ON VENDORS.
- o DATA INDICATES THAT BILL ACCURACY, OVERALL SERVICE QUALITY AND BILL TIMELINESS ARE HIGHLY IMPORTANT AND SHOW THE GREATEST DEFICIENCIES.
- o CONTRACTUAL TERMS BRING UP THE BOTTOM OF THE LIST. NOTE PARTICULARLY THE SLIM MARGIN IN THE 4/5 RATINGS AT 34% VS. 49%. THIS IS THE AREA OF LEAST DIFFERENTIAL AND DOES NOT RECOMMEND ITSELF AS A KEY DIFFERENTIATOR.



SERVICE QUALITY RANKINGS (cont'd)

- o THE MEAN PROPORTION RATING 4/5 ON SERVICE QUALITY (GOOD/EXCELLENT) IS 44.7%. PRICE, RERUNS, DOCUMENT ATION AND CONTRACT PROPORTIONS ARE WELL BELOW THIS AVERAGE WHILE M.F. RELIABILITY AND BILL APPEARANCE ARE WELL ABOVE. WITH RESPECT TO THE MEAN, THESE CAN BE CONSIDERED TO HAVE THE LOWEST RELATIVE SATISFACTION INDEPENDENT OF IMPORTANCE.
- o BILL ACCURACY, OVERALL QUALITY AND TIMELINESS HAVE THE HIGHEST DEVIATION FROM THE MEAN PROPORTION OF "HIGH IMPORTANCE" VALUE OF 82.5%. LOWEST IS CONTRACT TERMS FOLLOWED BY RERUNS AND PRICE.





# INPUT®

Parsippany Place Corporate Center, Suite 201, 959 Route 46 East, Parsippany, NJ 07054 (201) 299-6999

May 5, 1986

Mrs. Patricia H. Price  
Manager-New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, Florida 33601

Dear Mrs. Price:

This will confirm our arrangement whereby we will expand the "Flamingo" study to include an additional forty (40) respondents. These will be equally divided between TI and GTE respondents on the "user" questionnaire. These two groups will be analyzed separately from the main run of eighty (80) users. If the results are similar they will be merged with the main group. If different, they will be presented separately with appropriate emphasis on both the differences found and the similarities. All work will be along the same lines as that in our proposal dated March 25, 1986.

The fee for this additional work will be \$16,000.00 as we agreed and will be billed at the conclusion of the engagement. Thank you for thinking of INPUT.

Sincerely,



D. W. Fostle  
Vice President

DWF/jh



March 25, 1986

Mrs. Patricia H. Price  
Manager-New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, Florida 33601

Dear Mrs. Price:

Based on last week's meeting with you, Paul Heller and your venture associates we at INPUT have prepared this proposal to assist in the assessment of the opportunity. Since those meetings we have also received and reviewed the study materials provided by your associates and have formulated a plan which we believe will:

1. Provide confirmation/disconfirmation of the need for a joint relationship.
2. Calibrate the market need for products and services which you might offer jointly and that GTEDS might offer individually.
3. Form a baseline market calibration which can be expanded, segmented and refined if the opportunity should prove favorable.

Of the for major tasks identified in the meeting of March 19, 1986 in Tampa this proposal relates principally to item II, Market Analysis but by necessity also relates to item I, Product and Services Definition. The essence of the task may be described as a test with "users" of the attractiveness and utility of the proposed products and services.

#### INPUT'S UNDERSTANDING

We understand the GTEDS believes there is significant commercial potential in a combination of:

1. A new input device for graphics and text
2. Software for the conversion of incompatible data systems to compatible formats.
3. Mainframe storage of converted and unconverted data.
4. Communications between devices requiring the above capabilities.

We further understand that there are material questions as to the mode in which such services/products may be delivered. These would include the possibility of a pure service offering in which the capabilities would be resident of GTE systems and sold to other parties on a usage basis. Another possibility would be that the capability would be sold as a "package" for installation on the buyer's system or systems. A third possibility would be some combination of sale and service, perhaps related to usage and the geographic distribution of that usage.



INPUT notes that the combination of hardware, software and communication envisioned by GTEDS provides a number of unique advantages in combination that are not available from the individual elements. Among these are:

1. A modified "E-mail" service in which it is possible to store, manipulate and transmit both text and graphics.
2. A movement from "screen-oriented" to "paper-oriented" instantaneous document transmission.
3. An implied manipulability of graphics as flexible as current text manipulation.
4. Digitized voice commentary.
5. A removal of previous device compatibility barriers, at least with respect to transmission of text.
6. An offering consonant with IBM system architecture and communications defacto standards.

While by no means exhaustive, the above list does set forth certain capabilities which may prove advantageous. In essence the proposed offering combines elements of facsimile, in-house publishing, electronic mail, personal computing and mainframe computing. It is further known to be in line with a certain general trends which include:

1. A desire for interconnection between large and small systems.
2. Increasing use of electronic document transmission.
3. Growing interest in graphics system and capabilities.
4. Greater need to allow communications between previously incompatible systems.

In the context of this understanding INPUT sets forth its proposal for calibrating the opportunity.

#### STUDY METHOD

It is axiomatic in testing the concepts involved in a product on service offering that the views of actual or potential users and decision makers must be taken into full account. In this instance it is believed that the most likely market in which there is a need for the proposed service is in large corporations. This is deemed likely for the following reasons:

1. Extremely high concentration of IBM mainframe equipment, a necessary pre-condition for the offering.
2. Extremely high incidence of personal computers, another pre-condition.
3. Geographic dispersion of facilities, a desirable characteristic.
4. Diverse types of "ad hoc" DP equipment installations, a necessary pre-condition for the software component.



5. The vast majority of information services and DP expenditures occur among these firms. This implies that on a "per contact" basis revenue potential is maximized.

While a preliminary definition of the desirable universe of firms is derivable with ease, a more difficult task is the determination of interviewee. A complex system of the type envisioned could be installed at a central site and "imposed" upon users. Alternatively, users could "demand" certain capabilities of the system if known to them. In reality, successful adoptions of complex technology require the intersection of user needs and central responses. Accordingly, we propose to interview both central management and dispersed users for this study. In the interests of minimum execution time and reasonable expense we propose that such interviews be conducted by telephone and in a standard format to be agreed upon by GTEDS and INPUT.

Contents of the interview should focus on the need, importance of that need and likely timing of implementation of each component of the proposed offering. This is most efficiently accomplished by scalar rating techniques. For example, "How important (on a scale of 1 to 5) is it that you be able to store graphics and text documents on your personal computer?" or "How important is it that you be able to store graphics and text documents on a central system?" A thoroughly developed protocol will allow the development of a needs inventory against which the proposed product/service may be matched.

When the needs inventory is combined with site related data such as equipment installed and services used and with respondent data such as job function, a relatively clear picture of the viability of the product/service will emerge, one sufficient to allow determination of both the "goodness" of the project and its likely scale and scope.

For the preliminary market analysis phase, INPUT recommends that a total of 120 interviews be conducted. These will be allocated as 80 user interviews, i.e. PC users in large company departments and 40 central management interviews, these latter comprised of MIS or O/A management. The appropriateness of the interviews will be guarded by a carefully developed screening protocol and GTEDS will have access to the titles of respondents on an individual basis.

Through the use of appropriate analytical techniques, GTEDS will understand at the conclusion of the engagement the:

1. Product/Service characteristics most in demand.
2. Functions/tasks most in need of those capabilities.
3. Likely rate of growth for demand.
4. Most suitable delivery mode for service.
5. Commercial viability and scale (which imply and appropriate level of investment, if any).

INPUT wishes to emphasize the imperative need to develop a full inventory of service features and capabilities. While this is currently well understood for the "input device" it is much less well understood by us in the software





and communications aspects of the service. Effective execution of this study has as a given a full service inventory. In our view, this topic needs immediate attention.

#### ROLE OF EXISTING RESEARCH

Research provided by the potential venture partner shows positive signs of demand for the input device. While this is certainly encouraging, this work was necessarily silent on the device in the context of GTEDS more complete service offering. Accordingly, there will be some need to re-test the input device as a part of a larger system and determine its relationship to that system. Accordingly, we believe that the existing research, while encouraging, does not reflect directly on GTEDS business case or the potential of the expanded offering.

#### WORKING RELATIONSHIP & DELIVERABLES

During the course of this engagement INPUT will:

1. Assist GTEDS in the development of the service inventory.
2. Assist (as requested) in developing cost data.
3. Generate two related questionnaires for MIS management and users for GTEDS approval.
4. Administer said questionnaires by telephone interview to 40 MIS/OA managers in large firms by random selection and to 80 PC users.
5. Analyze the data gathered to the above points with an emphasis on comparisons between the two groups.
6. Present the results of the analysis to GTEDS management with recommendations for action and rationale for those recommendations.
7. Work closely with members of the project team during the engagement and keep GTEDS fully apprised of study direction and interim findings.

#### SCHEDULE & FEES

INPUT believes that the survey portion of this engagement to include questionnaire development, sample selection, interviews and analysis can be accomplished within six weeks from the availability of the service inventory mentioned above. During the engagement GTEDS will be apprised of interim findings to assist in decision making processes and the relationship with the potential partner.

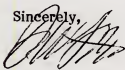
The fee for the engagement will be \$38,750 payable in two installments of \$19,375, the first at the onset of the engagement and the second at completion. Expenses for travel, expedited delivery services, extra copies and kindred items (if any) are billed at the completion of the engagement and at cost. Expenses in excess of 5% of the project fee will not be incurred without the permission of the GTEDS project supervisor. Fees shall be due and payable within 30 days of invoice date.



## CONCLUSION

We look forward to working with GTEDS on this demanding market analysis assignment and related tasks. For your convenience an authorization block as been provided. Simply sign appropriately and return this document to the letterhead address. Should there be any questions, please contact the undersigned.

Sincerely,



D. W. Fostle  
Vice President

Accepted by GTE Data Services:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Accepted by INPUT:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_



February 24, 1986

Mrs. Patricia H. Price  
Manager - New Business Ventures  
GTE Data Services  
First Florida Tower  
P.O. Box 1548  
Tampa, FL 33601

Dear Mrs. Price: -

Based on recent meetings with you and others within GTEDS line and senior management, INPUT is pleased to present this proposal for assistance in acquisition and joint venture activities.

While the concepts are similar to the earlier proposal, we are now able to recommend certain specific activities based not only on the meetings but also taking into account the excellent "basic plan" which you had prepared.

From a logistic standpoint we see the required activities as divisible into tasks, each with separate but interlocking objectives. The tasks have considerable concurrence but do not overlap completely. As a result the overall project duration is as short as possible while remaining orderly in nature. Given the internal pressures to acquire or strike up other productive relationships, we feel that a concurrent approach is greatly preferable to a serial one, particularly since pressures are likely to increase with time. Without further preliminaries, here are the tasks as we see them.

#### TASK ONE

Primary Objective: Permit GTEDS to realistically evaluate the performance of potential partners and/or acquirees by actual "industry standard" measures in the dynamic context of current and past industry performance.

Recommended Method: INPUT will provide GTEDS with company financial information, operating data and ratios as well as market valuations by four industry groups. These groups are:

1. Processing Services Companies
2. Software Companies
3. Turnkey Companies
4. Professional Service Companies

This data shall be provided as two year quarterly financial performance on a range of measures including revenue, revenue change, profit, profit changes, margins, revenue per employee, return on equity, receivable age and other conventional measures. The data shall cover 100-125 firms appropriately distributed within the four industries. It is important to understand that this data is tracked by INPUT and is not available from standard databases.

For approximately 300 firms in the same four groups INPUT will present an analysis of expense proportions (including marketing, sales, R&D, G&A, etc.) by group and



size to show typical expenditure patterns and expenditure proportions of least and most profitable firms. Highly detailed data is available.

INPUT will analyze the data for mean performance for each group as well as the top and bottom deciles. With respect to over and underperformance, efforts will be directed to isolating the cause of the non-standard performances and determining what practical lessons can be learned for use in new venture, internal planning and competitive analysis areas.

Interaction with GTEDS acquisition and planning teams is strongly recommended during this task to meet two goals:

1. Improve GTEDS' of the dynamics of firms and groups for use in internal planning activity and competitive analysis.
2. Facilitate the development of rational criteria and expectations for acquisitions, joint ventures and the evaluation of candidates, prospects and suspects.

To accomplish these objectives we recommend two - three days of working sessions surrounding the presentation of the company and industry financial analyses. The estimated duration of this task is six to eight weeks calendar time.

#### TASK TWO

Primary Objective: Bring to the attention of the GTEDS acquisition/joint venture team firms which have merit in light of financial and other criteria as expressed by GTEDS management. These include:

1. Relationship to existing TIBS unit.
2. Appropriate financial performance.
3. Complementary to existing product set.
4. Supplementary to existing sales channels.
5. Targeted towards large Telcos.

While these are the primary criteria, INPUT will not lose sight of other possible relationships or "plays" outside these criteria. The screening activity will cover not only discrete firms but also divisions and subsidiaries of larger firms whose main activity will not necessarily be in an area related to telephony. While INPUT understands that the general requirement is to assemble a "portfolio" of small to medium-sized firms, other possibilities will not be excluded pro forma.

INPUT will begin the screening process with a pass through its database and a review of its files to determine the universe of prospective firms. Based on our knowledge of the data, there will not be fewer than 450 firms and divisions included in the first pass. Based on conformance to stated criteria (and others which may be developed) INPUT will reduce the preliminary list to a second list of approximately 50 firms. In the event that more than 50 firms appear, a secondary list will also be created for the review of GTEDS.

For those 50 firms a brief profile will be created which will enumerate basic company information such as primary products, market and geographic areas served, sales method, growth, reputation, primary expertise and similar information sufficient to GTEDS and INPUT to jointly determine the "goodness of fit" of the unit





and its potential as a venture partner or acquirer. Particular attention will be paid in this phase to the "portfolio" of companies it might be possible to assemble in support of the TIBS business unit. This may be properly considered to be an exercise in a "trial assembly" of an enhanced market position for TIBS.

From the larger list GTEDS and INPUT will develop a "Top Ten" which will be subject to a more rigorous and thorough investigation using all available INPUT resources including contact with the company.

Based on the data developed on the Top Ten, decisions will be made by GTEDS on priority approach, best method of approach, nature of proposed relationship and related factors, all with an eye toward achieving a level and type of contact appropriate to GTEDS goals as quickly as possible.

Once again we wish to recommend that this be an "interactive" task in which GTEDS team members work closely with INPUT in the review of the brief profiles and the development of detailed profiles. Estimated calendar duration for this task is eight to nine weeks, overlapping substantially with Task One.

It is also important to note that this activity is not in conflict with existing or proposed GTEDS company contact activities. These may proceed independently but should - at some point - be subject to a similar screening and evaluation regimen.

### TASK THREE

Primary Objective: Assist GTEDS in determining the viability of an offering in the Cellular Billing area via standard techniques of market assessment.

Comment: Task Three is somewhat less developed in its specifics due to the recent emergence of this area (from INPUT's perspective) and the lack of specific discussions at meetings which have been held. Prior work in cellular allows us to outline a suggested approach to the evaluation of this opportunity.

Possible Recommended Method: Based on our limited knowledge of GTEDS activities, the key question would appear to be: "Can GTEDS - building on its possible internal base of Mobilenet bill processing - create a viable cellular billing services offering?" A confident answer to this question requires certain data including:

- Current & future market size.
- Market Segmentation by such criteria as:
  - a. Wireline/Non-wireline/reseller
  - b. Cellular market size (Top 30, Second 30, etc.)
  - c. Bill processing mode, current and future
- Capabilities & plans of current competitors
- Customer satisfaction with presently available solutions and customer plans.
- Estimate of available market, now and in the future, perhaps as number of bills per month or similar measure.



- Importance of pricing/processing economics
- GTEDS "true" cost to provide service.
- Influence of price on customers; service/price trade-offs.

This implies two discrete activities. The first may be considered "secondary" research on market size and dynamics as well as basic competitive analysis (there are at least nine service firms in the market). The second task would require interview work with customers of current services. It is not presently possible to specify the cost of this research since it may be that some of the necessary data is already known within GTE and it is further true that the outcome of the first task could materially alter the complexity of the second. Generally speaking a basic market assessment typically involves an expenditure of \$10,000 to \$15,000 and a detailed customer survey \$20,000 to \$27,000 for up to 50 customers for very in-depth interviews. Typical duration on a calendar basis is eight to ten weeks, although it may be possible to shorten this interval if necessary. It is also worth noting that several of the competitors in this market might potentially be candidates for joint venture or acquisition. This creates a linkage between all three tasks. INPUT looks forward to developing a full specification and detailed cost quote for this task with appropriate GTEDS staff.


#### SCHEDULE & FEES

As indicated, the calendar durations for Tasks One and Two are approximately eight weeks for the first and nine weeks for the second. We believe that with appropriate overlap, both tasks could be completed in ten to eleven weeks, possibly sooner dependent upon logistics. The combined fee for the first two tasks is \$43,720.00 which is payable in two equal installments of \$21,860, one payment at the onset of the engagement and the second at conclusion. Expenses for travel, documents, expedited delivery services and related items (if any) are billed at documentable cost at the conclusion of the engagement. Expenses in excess of 5% of the base fee will not be incurred without the express permission of the GTEDS project supervisor.

#### CONCLUSION

INPUT looks forward to working closely with GTE Data Services on this challenging engagement. For your convenience an authorization block has been provided below. Simply sign appropriately and return a copy of this document to the New Jersey address on the letterhead. Should there be any questions or need for clarification, please contact the undersigned. Thank you for thinking of INPUT.

Sincerely,

  
D.W. Fostle  
Vice President

Accepted by GTE Data Services:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Accepted by INPUT:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_







### CELLULAR BILLING SERVICES

Good morning (afternoon). This is \_\_\_\_\_  
calling from INPUT, an international research and planning firm. We have  
been engaged to conduct a study which we believe is of considerable  
importance to the cellular industry. Specifically we have been asked to  
investigate the possibilities for improvement in the area of cellular  
telephone billing systems. All information you provide will be held in the  
highest confidence and your identity will not be revealed. In return for a  
few minutes of your time we will send you a research summary of the  
results of the study so that you may compare your views with others in the  
industry. May we begin? Thank you.





CELLULAR BILLING SERVICES

Good morning (afternoon). This is \_\_\_\_\_  
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few minutes of your time we will send you a research summary of the  
results of the study so that you may compare your views with others in the  
industry. May we begin? Thank you.



1. First we would like to verify a few items which appear on the record. Are you a: (check one)

a. Wireline carrier \_\_\_\_\_  
b. Non-wireline carrier \_\_\_\_\_

2. Thank you. Now what firm or firms hold the license for your territory?

a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_  
d. \_\_\_\_\_  
e. \_\_\_\_\_

DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

3. What date did your service become operational?

\_\_\_\_\_ Mo. \_\_\_\_\_ Day \_\_\_\_\_ Yr. NOT OPERATIONAL \_\_\_\_\_

START DATE \_\_\_\_\_ (SKIP TO QUESTION 7) DK \_\_\_\_\_

NA \_\_\_\_\_ REF \_\_\_\_\_

4. As of June, 1986 what was the approximate number of subscribers?

# \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

INT: (IF OTHER DATE IS GIVEN, SO NOTE.)

5. I see. What percentage increase would you expect in the number of subscribers at this time next year, that is in 1987?

% INCREASE \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_



6. And in three years, what increase would you expect from current levels in the number of subscribers?

3 YR. % INCREASE \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

7. Thinking now about billing systems, which of these descriptions best fits your current system? (INT: READ ALL)

- a. A mainframe system using terminals that is provided by another firm that is not one of your license holders? \_\_\_\_\_
- b. A microprocessor only system from a firm not one of your license holders? \_\_\_\_\_
- c. A system provided by a license holder or other corporate affiliate? \_\_\_\_\_
- d. Other \_\_\_\_\_

(INT: GET MAKE & MODEL OF PROCESSOR, SOFTWARE SOURCE FOR ANY ANSWER)

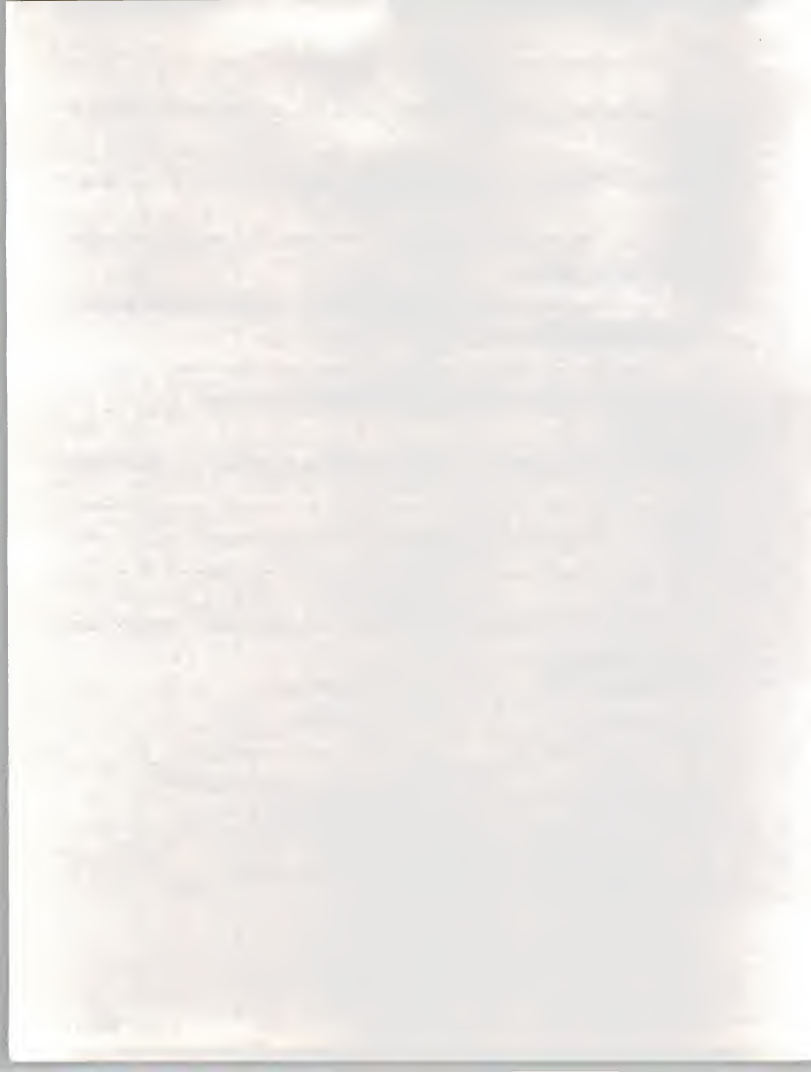
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. What is the name of the organization providing your billing services? (INT: DO NOT READ TO RESPONDENT)

- |                            |                                     |
|----------------------------|-------------------------------------|
| a. AUXTON _____            | h. New Vector _____                 |
| b. Bell Atlantic _____     | i. NA, REF _____                    |
| c. Cinn. Bell (CBIS) _____ | j. In house, this location _____    |
| d. CBSI (CHL) _____        | k. In house, another location _____ |
| e. Celltech _____          | l. Other (specify) _____            |
| f. Cellular Software _____ |                                     |
| g. Bank of Illinois _____  |                                     |



Thank you. Now we would like to turn your attention to some specific capabilities of billing systems and ask you how important they are to you in terms of your operations. To measure importance we use a scale of one to five with "one" meaning unimportant and "five" indicating very important. If you are unfamiliar with a capability, please tell us by saying "don't know," and also indicate which capabilities you are presently using. By the way, these capabilities are not presented in any particular order. Let's begin: How important or unimportant is automatic interfacing between the switch (MTSO) and the billing system? (PAUSE) How important will it be in three years?

	<u>USING NOW</u>	<u>IMPORTANCE NOW</u>	<u>IMPORTANCE 3 YEARS</u>
9.	AUTO INTERFACE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
10.	HOW ABOUT ON-LINE PAYMENT HISTORY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
11.	HOW IMPORTANT IS ONLINE ORDER ENTRY CAPABILITY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
(REF TO Q. 1 AND ASK 12 or 13)			
12.	(IF YOU ARE A NON-WIRELINE) PROCESSING BY A WIRELINE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
13.	(IF YOU ARE A WIRELINE) PROCESSING BY A NON-WIRELINE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
14.	MULTIPLE SITE PROCESSING CAPABILITY FOR BACK-UP? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF





	<u>USING NOW</u>	<u>NOW</u>	<u>3 YEARS</u>
15.	ON-LINE CUSTOMER ACCOUNT INQUIRY & BILL ADJUSTMENT? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
16.	REDUCED ON-LINE COSTS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
17.	NETWORK REDUNDANCY TO ENSURE RELIABILITY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
18.	BILL MAILING WITHIN 3 DAYS OF MONTHLY CLOSING? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
19.	MULTIPLE BILLING CYCLES PER MONTH PER MARKET? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
20.	BALANCING BILLING OF CYCLE LOADS? (TENTH DIGIT BILLING) YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
21.	LASER PRINTING OF CUSTOMER BILLS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
22.	CENTRALIZED SWITCH MANAGEMENT FOR MAINTENANCE & ADMINISTRATION YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
23.	MAINFRAME BASED BILLING SYSTEMS YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF



	<u>USING NOW</u>	<u>IMPORTANCE NOW</u>	<u>IMPORTANCE 3 YEARS</u>
24.	MICRO BASED BILLING SYSTEMS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
25.	HOW IMPORTANT IS COMBINATION OF MICRO/MAINFRAME? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
26.	MASS MODIFICATION FOR CREDITS AND/OR CHARGES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
27.	MOVING BILLING DATA BY ELECTRONIC TRANSMISSION INSTEAD OF TAPE? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
28.	LOCK BOX SERVICES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
29.	REMOTE ACCOUNT INITIATION FOR AGENTS AND RESELLERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
30.	A SINGLE CLEARING HOUSE FOR ROAMERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
31.	INDIVIDUAL COMPANY AGREEMENTS FOR ROAMERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF



	<u>USING NOW</u>	<u>IMPORTANCE NOW</u>	<u>IMPORTANCE 3 YEARS</u>
32.	INTER-COMPANY ROAMER RECEIVABLES SETTLEMENTS HANDLED BY THE CLEARING HOUSE? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
33.	TREATMENT PROCESSING FOR DELINQUENT ACCOUNTS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
34.	DEPOSIT ACCOUNTING WITH INTEREST COMPUTATION? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
35.	AVAILABLE NUMBER INVENTORY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
36.	VENDOR MAINTENANCE OF SYSTEM TABLES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
37.	USER MAINTENANCE OF SYSTEM TABLES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
38.	BILLING ON DEMAND? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
39.	REMOTE SERVICE ACTIVATION BY AGENTS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
40.	BILL PROCESSING IN YOUR IMMEDIATE AREA? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF



40b. Do you use the same billing services supplier for both wholesale and retail? \_\_\_\_\_

(INT: IF MORE THAN 1 SUPPLIER USE INSERT SHEET FOR WHOLESALE)

Thank you. Thinking now about your current supplier of billing services, we would like to understand your views on some dimensions of service provided. On this scale a "one" is poor while a "five" represents excellent quality. Now how would you rate your current provider on accuracy of bills? How important is accuracy?

(INT: ASK FOR QUALITY OF CURRENT PROVIDER AND IMPORTANCE)

		<u>QUALITY</u>					<u>IMPORTANCE</u>				
41.	ACCURACY	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
42.	RATE YOUR CURRENT SUPPLIER ON THE NEED FOR RE-RUNS OF BILLING CYCLES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
43.	TIMELINESS OF BILL PROCESSING?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
44.	RELIABILITY OF MAIN BILLING SYSTEM?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
45.	RELIABILITY OF ON-LINE SYSTEM?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
46.	QUALITY OF MANAGEMENT REPORTS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
47.	FLEXIBILITY OF RATING UP-DATES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		





		<u>QUALITY</u>					<u>IMPORTANCE</u>				
48.	VENDOR DOCUMENTATION?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
49.	VENDOR TRAINING?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
50.	TECHNICAL ASSISTANCE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
51.	CUSTOM PROGRAMMING CAPABILITIES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
52.	APPEARANCE OF BILLS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
53.	CONTRACTUAL TERMS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
54.	EASY TO USE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
55.	PRICE PER BILL?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
56.	OVERALL QUALITY OF SERVICE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		



Thinking now about pricing, we would like you to rate an ideal service - that is one which meets the need profile we have discussed - on a cost per bill basis. The costs we are about to quote would include all ordinary charges except postage. On this scale "one" represents poor value while five represents excellent value. How would you rate the value of your "ideal" service at?

- |     |   | <u>VALUE</u>  |
|-----|---|---|
| 57. | \$5.00 PER BILL   | <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <span>1</span><span>2</span><span>3</span><span>4</span><span>5</span> </div> <div style="display: flex; justify-content: space-around;"> <span>DK</span><span>NA</span><span>REF</span> </div> |
| 58. | \$3.50 PER BILL   | <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <span>1</span><span>2</span><span>3</span><span>4</span><span>5</span> </div> <div style="display: flex; justify-content: space-around;"> <span>DK</span><span>NA</span><span>REF</span> </div> |
| 59. | \$2.50 PER BILL   | <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <span>1</span><span>2</span><span>3</span><span>4</span><span>5</span> </div> <div style="display: flex; justify-content: space-around;"> <span>DK</span><span>NA</span><span>REF</span> </div> |
| 60. | \$1.75 PER BILL   | <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <span>1</span><span>2</span><span>3</span><span>4</span><span>5</span> </div> <div style="display: flex; justify-content: space-around;"> <span>DK</span><span>NA</span><span>REF</span> </div> |
| 61. | \$1.25 PER BILL   | <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <span>1</span><span>2</span><span>3</span><span>4</span><span>5</span> </div> <div style="display: flex; justify-content: space-around;"> <span>DK</span><span>NA</span><span>REF</span> </div> |
| 62. | <p>Thinking now about roaming services, what price would you consider to be a <u>fair</u> price to pay per roamer call billed through a clearinghouse?</p> <p>PRICE \$ _____ PER CALL</p> |   |



63. What price per roamer call would you consider represented excellent value?

PRICE \$ \_\_\_\_\_ PER CALL

64. Thank you, there are only a few more questions. Thinking about your current billing provider, what would you say are that provider's greatest strengths?

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65. And what would you say are the areas most in need of improvement by that provider?

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66. Thinking about the future, how likely is it on a scale of one to five with "one" unlikely and five "very" likely that you would consider changing billing providers?

1   2   3   4   5   DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

67. Why is that? (INT: PROBE ON THIS)

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68. Are there any significant aspects of billing or service needs that we have missed from your perspective?

YES \_\_\_\_\_ NO \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

69. IF YES: What might those be?

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Thank you, that completes the interview. The time you took to express your views is greatly appreciated. In about 90 days you will be receiving a research summary. May I have your mailing address?

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

ADDRESS \_\_\_\_\_

---

---





ORIGINAL  
FOR  
2-SIDE COPY

CELLULAR BILLING SERVICES

Good morning (afternoon). This is \_\_\_\_\_  
calling from INPUT, an international research and planning firm. We have  
been engaged to conduct a study which we believe is of considerable  
importance to the cellular industry. Specifically we have been asked to  
investigate the possibilities for improvement in the area of cellular  
telephone billing systems. All information you provide will be held in the  
highest confidence and your identity will not be revealed. In return for a  
few minutes of your time we will send you a research summary of the  
results of the study so that you may compare your views with others in the  
industry. May we begin? Thank you.

1. First we would like to verify a few items which appear on the record. Are you a: (check one)

- a. Wireline carrier \_\_\_\_\_  
b. Non-wireline carrier \_\_\_\_\_

2. Thank you. Now what firm or firms hold the license for your territory?

- a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_  
d. \_\_\_\_\_  
e. \_\_\_\_\_  
DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

3. What date did your service become operational?

\_\_\_\_\_ Mo. \_\_\_\_\_ Day \_\_\_\_\_ Yr. NOT OPERATIONAL \_\_\_\_\_  
START DATE \_\_\_\_\_ (SKIP TO QUESTION 7) DK \_\_\_\_\_  
NA \_\_\_\_\_ REF \_\_\_\_\_

4. As of June, 1986 what was the approximate number of subscribers?

# \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_  
INT: (IF OTHER DATE IS GIVEN, SO NOTE.)

5. I see. What percentage increase would you expect in the number of subscribers at this time next year, that is in 1987?

% INCREASE \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

6. And in three years, what increase would you expect from current levels in the number of subscribers?

3 YR. % INCREASE \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

7. Thinking now about billing systems, which of these descriptions best fits your current system? (INT: READ ALL)

- a. A mainframe system using terminals that is provided by another firm that is not one of your license holders? \_\_\_\_\_
- b. A microprocessor only system from a firm not one of your license holders? \_\_\_\_\_
- c. A system provided by a license holder or other corporate affiliate? \_\_\_\_\_
- d. Other \_\_\_\_\_

(INT: GET MAKE & MODEL OF PROCESSOR, SOFTWARE SOURCE FOR ANY ANSWER)

---

---

---

8. What is the name of the organization providing your billing services?

- |                            |                                     |
|----------------------------|-------------------------------------|
| a. AUCTON _____            | h. New Vector _____                 |
| b. Bell Atlantic _____     | i. NA, REF _____                    |
| c. Cinn. Bell (CBIS) _____ | j. In house, this location _____    |
| d. CBSI (CHL) _____        | k. In house, another location _____ |
| e. Celltech _____          | l. Other (specify) _____            |
| f. Cellular Software _____ |                                     |
| g. Bank of Illinois _____  |                                     |

Thank you. Now we would like to turn your attention to some specific capabilities of billing systems and ask you how important they are to you in terms of your operations. To measure importance we use a scale of one to five with "one" meaning unimportant and "five" indicating very important. If you are unfamiliar with a capability, please tell us by saying "don't know," and also indicate which capabilities you are presently using. By the way, these capabilities are not presented in any particular order. Let's begin: How important or unimportant is automatic interfacing between the switch (MTSO) and the billing system? (PAUSE) How important will it be in three years?

	<u>USING NOW</u>	<u>IMPORTANCE NOW</u>	<u>IMPORTANCE 3 YEARS</u>
9.	AUTO INTERFACE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
10.	HOW ABOUT ON-LINE PAYMENT HISTORY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
11.	HOW IMPORTANT IS ONLINE ORDER ENTRY CAPABILITY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
(REF TO Q. 1 AND ASK 12 or 13)			
12.	(IF YOU ARE A NON-WIRELINE) PROCESSING BY A WIRELINE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
13.	(IF YOU ARE A WIRELINE) PROCESSING BY A NON-WIRELINE YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
14.	MULTIPLE SITE PROCESSING CAPABILITY FOR BACK-UP? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF

	<u>USING NOW</u>	<u>NOW</u>	<u>3 YEARS</u>
15.	ON-LINE CUSTOMER ACCOUNT INQUIRY & BILL ADJUSTMENT? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
16.	REDUCED ON-LINE COSTS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
17.	NETWORK REDUNDANCY TO ENSURE RELIABILITY? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
18.	BILL MAILING WITHIN 3 DAYS OF MONTHLY CLOSING? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
19.	MULTIPLE BILLING CYCLES PER MONTH PER MARKET? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
20.	BALANCING BILLING OF CYCLE LOADS? (TENTH DIGIT BILLING) YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
21.	LASER PRINTING OF CUSTOMER BILLS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
22.	CENTRALIZED SWITCH MANAGEMENT FOR MAINTENANCE & ADMINISTRATION YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
23.	MAINFRAME BASED BILLING SYSTEMS YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF

	<u>USING NOW</u>	<u>IMPORTANCE NOW</u>	<u>IMPORTANCE 3 YEARS</u>
24.	MICRO BASED BILLING SYSTEMS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
25.	HOW IMPORTANT IS COMBINATION OF MICRO/MAINFRAME? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
26.	MASS MODIFICATION FOR CREDITS AND/OR CHARGES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
27.	MOVING BILLING DATA BY ELECTRONIC TRANSMISSION INSTEAD OF TAPE? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
28.	LOCK BOX SERVICES? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
29.	REMOTE ACCOUNT INITIATION FOR AGENTS AND RESELLERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
30.	A SINGLE CLEARING HOUSE FOR ROAMERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF
31.	INDIVIDUAL COMPANY AGREEMENTS FOR ROAMERS? YES _____ NO _____	1 2 3 4 5 DK NA REF	1 2 3 4 5 DK NA REF

	USING NOW	IMPORTANCE NOW					IMPORTANCE 3 YEARS				
32.	INTER-COMPANY ROAMER RECEIVABLES SETTLEMENTS HANDLED BY THE CLEARING HOUSE? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
33.	TREATMENT PROCESSING FOR DELINQUENT ACCOUNTS? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
34.	DEPOSIT ACCOUNTING WITH INTEREST COMPUTATION? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
35.	AVAILABLE NUMBER INVENTORY? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
36.	VENDOR MAINTENANCE OF SYSTEM TABLES? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
37.	USER MAINTENANCE OF SYSTEM TABLES? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
38.	BILLING ON DEMAND? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
39.	REMOTE SERVICE ACTIVATION BY AGENTS? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
40.	BILL PROCESSING IN YOUR IMMEDIATE AREA? YES _____ NO _____	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		

40b. Do you use the same billing services supplier for both wholesale and retail? \_\_\_\_\_

(INT: IF MORE THAN 1 SUPPLIER USE INSERT SHEET FOR WHOLESALE)

Thank you. Thinking now about your current supplier of billing services, we would like to understand your views on some dimensions of service provided. On this scale a "one" is poor while a "five" represents excellent quality. Now how would you rate your current provider on accuracy of bills? How important is accuracy?

(INT: ASK FOR QUALITY OF CURRENT PROVIDER AND IMPORTANCE)

		<u>QUALITY</u>					<u>IMPORTANCE</u>				
41.	ACCURACY	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
42.	RATE YOUR CURRENT SUPPLIER ON THE NEED FOR RE-RUNS OF BILLING CYCLES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
43.	TIMELINESS OF BILL PROCESSING?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
44.	RELIABILITY OF MAIN BILLING SYSTEM?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
45.	RELIABILITY OF ON-LINE SYSTEM?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
46.	QUALITY OF MANAGEMENT REPORTS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
47.	FLEXIBILITY OF RATING UP-DATES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		



		<u>QUALITY</u>					<u>IMPORTANCE</u>				
48.	VENDOR DOCUMENTATION?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
49.	VENDOR TRAINING?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
50.	TECHNICAL ASSISTANCE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
51.	CUSTOM PROGRAMMING CAPABILITIES?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
52.	APPEARANCE OF BILLS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
53.	CONTRACTUAL TERMS?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
54.	EASY TO USE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
55.	PRICE PER BILL?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		
56.	OVERALL QUALITY OF SERVICE?	1	2	3	4	5	1	2	3	4	5
		DK	NA	REF			DK	NA	REF		

Thinking now about pricing, we would like you to rate an ideal service - that is one which meets the need profile we have discussed - on a cost per bill basis. The costs we are about to quote would include all ordinary charges except postage. On this scale "one" represents poor value while five represents excellent value. How would you rate the value of your "ideal" service at?

		VALUE				
57.	\$5.00 PER BILL	1	2	3	4	5
		DK	NA	REF		
58.	\$3.50 PER BILL	1	2	3	4	5
		DK	NA	REF		
59.	\$2.50 PER BILL	1	2	3	4	5
		DK	NA	REF		
60.	\$1.75 PER BILL	1	2	3	4	5
		DK	NA	REF		
61.	\$1.25 PER BILL	1	2	3	4	5
		DK	NA	REF		

62. Thinking now about roaming services, what price would you consider to be a fair price to pay per roamer call billed through a clearinghouse?

PRICE \$ \_\_\_\_\_ PER CALL

63. What price per roamer call would you consider represented excellent value?

PRICE \$ \_\_\_\_\_ PER CALL

64. Thank you, there are only a few more questions. Thinking about your current billing provider, what would you say are that provider's greatest strengths?

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65. And what would you say are the areas most in need of improvement by that provider?

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66. Thinking about the future, how likely is it on a scale of one to five with "one" unlikely and five "very" likely that you would consider changing billing providers?

1   2   3   4   5   DK   NA   REF

67. Why is that?

---

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---

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68. Are there any significant aspects of billing or service needs that we have missed from your perspective?

YES \_\_\_\_\_ NO \_\_\_\_\_ DK \_\_\_\_\_ NA \_\_\_\_\_ REF \_\_\_\_\_

69. IF YES: What might those be?

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Thank you, that completes the interview. The time you took to express your views is greatly appreciated. In about 90 days you will be receiving a research summary. May I have your mailing address?

NAME

---

TITLE

---

ADDRESS

---

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## 1985 QUARTERLY SCHEDULING PLAN Q1

PROJECT: Y611DATE: 5/28/86PROJECT LEADER: FOSTLE

CORPORATE/WEEK ENDING

JUNE  
JANUARYJULY  
FEBRUARYAUG  
MARCH

ACTIVITY	PROJECT	NAME	MAN DAYS	EFFI- CIENCY	ESMD	CORP WEEK END	1 1/4	2 1/11	3 1/18	4 1/25	5 2/1	6 2/8	7 2/15	8 2/22	9 3/1	10 3/8	11 3/15	12 3/22	13 3/29
PROJECT AUTHORIZATION/ SPECIFICATION		ALF		1	2		2												
Q DESIGN		ALF			3			3											
Q APPROVAL/ REVIEW MEETING		ALF			1				1										
INTERVIEWS ON SITE ( ) NO.																			
INTERVIEWS PHONE ( ) NO.			18	5	9					9									
DATATAB AND ANALYSIS					10							10							
WRITING					4											4			
ABSTRACT					-														
QC					-														
REPORT PROD. AND SHIPPING																			
PRESENTATION					1													-1-	
"THANK YOU" MAILED					1														-1-
PLAN																			
ACTUAL																			
CUM P/A																			

TOT = 31



TITLE

CELLULAR RADIO

5/28/88

CLIENT

LTE DATA SERVICES

4611

CONTRACT: ATTACHED TO FOLLOW LETTER ☒ VERBAL

PROJECT LEADER

DWF

CODE

4611

DATE STARTED

5/19/88

PLANNED COMPLETION DATE

8/30/86

LEVEL OF EFFORT (Professional Man Days)

31

TOTAL CONTRACT VALUE: \$

638,800

REVENUE DISTRIBUTION (% or \$) INPUT US

USD

INPUT LTD

REIMBURSABLE EXPENSES: NO

YES

☒

EXP. BUDGET

TO COVER:

TRAV:

TEL:

RPT. PREP.:

OTHER:

BILLING SCHEDULE DESCRIPTION

50/50 SPLIT

PROJECT DESCRIPTION

REVENUE SPLIT OF BILL

PROCESSING METHODS @ CELLULAR PROVIDERS,

WIRELINE &amp; NON-WIRELINE

INDICATE TYPE OF CUSTOM WORK:

REPORT

PRESENTATION

☒

THANK YOU PACKAGE:

YES

☒

NO

☐





Y611

INPUT NEW JERSEY

ENCLOSED

PROJECT -Y611

- CONTRACT PROPOSAL
- OIF ✓
- W.S. ✓
- SKED ✓
- EXPENSES \_\_\_\_\_
- INVOICES \_\_\_\_\_

DATE SENT: 6/2/86 BY: DW

DATE RECEIVED: \_\_\_\_\_ BY: \_\_\_\_\_

EXCEPTIONS: Note below or check NONE \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



INPUT

ORDER/INVOICE/FULFILLMENT

Y611

ACTIVITY		ORIGINATOR (SIGNATURE) <u>[Signature]</u>		PREPARED BY: <u>DWF</u>		DATE: <u>5/28/88</u>																																																																																																	
		<input checked="" type="checkbox"/> NEW ORDER <input type="checkbox"/> CONTINUATION <input type="checkbox"/> CHANGE <input type="checkbox"/> CANCEL <input type="checkbox"/> SPECIAL:		<input type="checkbox"/> FULFILLMENT ONLY <input type="checkbox"/> SINGLE INVOICING <input checked="" type="checkbox"/> MULTI-INVOICING: NO. INVOICES <u>2</u> <input type="checkbox"/> PENDING:		COMMISSION TO: <u>DWF 100%</u> _____ % _____ % _____ %		SOLD BY: <u>DWF 100%</u> _____ % _____ % _____ %		APPROVED <u>[Signature]</u> INITIAL <u>SP/8/88</u> DATE																																																																																													
PRODUCT		<input checked="" type="checkbox"/> SUBSCRIPTION <input type="checkbox"/> CUSTOM <input type="checkbox"/> MULTICLIENT <input type="checkbox"/> REPORTS <input type="checkbox"/> COPIES <input type="checkbox"/> CONSULT/PRESENT. <input type="checkbox"/> TAPES/MATERIALS <input type="checkbox"/> REIMBURSED COSTS		US <input checked="" type="checkbox"/> UK _____ PROJ. ID/YEAR <u>Y611</u>		TITLE OR DESCRIPTION <u>CELLULAR RADIO</u>				AMOUNT <u>\$38,800</u>																																																																																													
CLIENT AUTH		P.O. # _____ INPUT CONTRACT <input type="checkbox"/> LETTER <input type="checkbox"/> VERBAL <input type="checkbox"/> ATTACH ALL AUTHORIZING DOCUMENTS TO WHITE (CONTRACT) COPY.																																																																																																					
		SHIP TO: * NAME <u>Mrs. Patricia H. Price</u> TITLE <u>MGR. NEW BUSINESS VENTURES</u> COMPANY <u>GTE DATA SERVICES</u> ADDRESS <u>FIRST FLORIDA TOWER</u> <u>P.O. Box 1548</u> <u>TAMPA FL 33601</u> PHONE (813) <u>224-3096</u>					INVOICE TO: (IF DIFFERENT) NAME _____ TITLE _____ COMPANY _____ ADDRESS _____ PHONE ( ) _____																																																																																																
INVOICE		* <input type="checkbox"/> Check here if more than one shipping address and attach names and addresses to green (fulfillment) copy.    * <input type="checkbox"/> Check here for address change to mail list.																																																																																																					
		INVOICE TO READ: (FOR OTHER THAN STANDARD WORDING) _____ _____ _____ SPECIAL INSTRUCTIONS FOR HANDLING, BILLING, STAGGERED OR DELAYED PAYMENTS, ETC. <u>50/50 SPL 17</u> _____ _____																																																																																																					
O.I.F. ONLY		INV. COMP.		BY:		DATE:		CLIENT #:		ORDER #:		INV. #:		MULTI-INVOICING _____ OF _____																																																																																									
ORIGINATOR/SHIPPING FULFILLMENT		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;">ITEM DESCRIPTION OR TITLE</th> <th style="width:5%;">NO.</th> <th style="width:5%;">BY</th> <th style="width:5%;">DATE</th> <th style="width:40%;">ITEM DESCRIPTION OR TITLE</th> <th style="width:5%;">NO.</th> <th style="width:5%;">BY</th> <th style="width:5%;">DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>														ITEM DESCRIPTION OR TITLE	NO.	BY	DATE	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE																																																																																
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FULFILLMENT TO BE COMPLETED IN: <input type="checkbox"/> PALO ALTO <input type="checkbox"/> LONDON <input type="checkbox"/> OTHER _____																																																																																																							



## 1985 QUARTERLY SCHEDULING PLAN Q1

PROJECT:

7611

DATE:

7611  
5/20/86

PROJECT LEADER:

FOSTER

JUNE

JULY

CORPORATE/WEEK ENDING

JANUARY

FEBRUARY

MARCH

ACTIVITY	PROJECT	NAME	MAN DAYS	EFFICIENCY	ESMD	CORP WEEK END	1 1/4	2 1/11	3 1/18	4 1/25	5 2/1	6 2/8	7 2/15	8 2/22	9 3/1	10 3/8	11 3/15	12 3/22	13 3/29
PROJECT AUTHORIZATION/SPECIFICATION		DEF			2		2												
Q DESIGN		DEF			3			3											
Q APPROVAL/REVIEW MEETING		DEF			1				1										
INTERVIEWS ON SITE ( ) NO.		5																	
INTERVIEWS PHONE ( ) NO.			18	15	9					9									
DATATAB AND ANALYSIS					10								10						
WRITING					4											4			
ABSTRACT					-														
QC					-														
REPORT PROD. AND SHIPPING																			
PRESENTATION					1													1	
"THANK YOU" MAILED					1														1
PLAN																			
ACTUAL																			
CUM P/A																			

607 = 31

INPUT



TITLE CELLULAR RADIO 5/28/85

CLIENT 67E DATA SERVICES

CONTRACT: ATTACHED TO FOLLOW LETTER ☒ VERBAL

PROJECT LEADER Wet CODE 9611

DATE STARTED 5/24/86 PLANNED COMPLETION DATE 8/30/86

LEVEL OF EFFORT(Professional Man Days) 31

TOTAL CONTRACT VALUE: \$ P38 800

REVENUE DISTRIBUTION (% or \$) INPUT US 150 INPUT LTD       

REIMBURSABLE EXPENSES: NO

YES ✓

EXP. BUDGET \_\_\_\_\_ TO COVER: TRAV: \_\_\_\_\_

TFL:

RPT. PREP.: \_\_\_\_\_

OTHER:

BILLING SCHEDULE DESCRIPTION 50/50 split

PROJECT DESCRIPTION *Reference copy of Blue*

### PROCESSING METHODS @ CELLULAR PROVIDERS,

Both WIRELINE & NON-WIRELINE.

INDICATE TYPE OF CUSTOM WORK: REPORT \_\_\_\_\_ PRESENTATION ✓

THANK YOU PACKAGE: YES ☒ NO ☐





# Whatever Happened to Cellular Radio?

## Or, Why the Boom in the New Technology Fizzled

By THOMAS G. DONLAN

WASHINGTON — In the *Iliad*, Cassandra received the gift of accurate prophecy of impending harm, and the curse that her prophecies would never be believed. She warned the Trojans not to bring that horse inside the city.

Herschel Shostek is something of a modern-day Cassandra. For most of the 'Eighties, he has been warning that cellular radio telephones are not quite the gold mine that most observers believe. When others, like Arthur Andersen & Co., predicted sales of seven million to 10 million new mobile telephones by 1990, Shostek said 1.5 million.

The first cellular systems went on line in late 1983, and now almost all of the top 90 cities in the country have service. The distinctive corkscrew-shaped cellular radio antenna is pretty much standard equipment in the BMW-Mercedes-Cadillac set. When you see someone walking along a downtown street in urgent, animated conversation with an invisible antagonist, there's now a chance it's a portable phone user instead of a troubled streetperson.

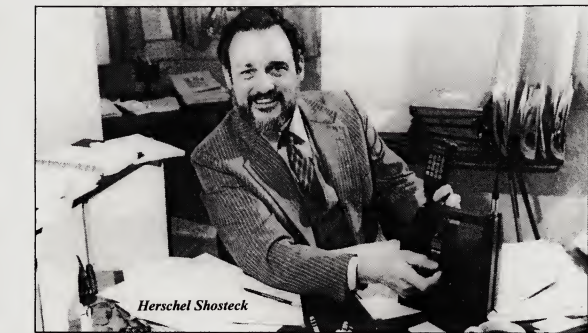
On Wall Street, investors can choose among at least two dozen companies with cellular properties, not counting the seven regional Bell holding companies, GTE and other telephone companies.

But Shostek's forecasts have proved most accurate. Cellular telephones in service number just about 325,000, or only about 10% higher than Shostek's gloomiest projection for this point. And investors can look and look, but they will not find a company making a decent return on its investment in cellular telephones.

"There's some positive cash flow, but no real profits," comments Shostek, who has just completed a survey of operating cellular systems in the 30 largest markets. The mail and phone inquiry was a form of "reality testing" for his theoretical estimates, he explains.

His conclusion: "There was no rainbow and there was no pot of gold at the end of it."

A sample of reported operating results reinforces the point. Southern New England Telephone says its cellular businesses won't reach break-even until next year. Ameritech says it doesn't know when it will make money in cellular; Alltel says it lost an unspecified amount in cellular in 1985 but considers it "attractive"; Cincinnati Bell says cellular cost it 20 cents a share in 1985; etc. Most of the smaller companies in the business lump their cellular results in with profits



Herschel Shostek

from paging, broadcasting and other businesses.

Why is cellular lagging so far behind the promise of its most ardent advocates? Why doesn't every real-estate agent, every traveling salesman, every construction superintendent, everyone who spends a large piece of the work day in a car, have a cellular telephone? The answer simply is price.

Everyone who knows the business, even mean ol' Herschel Shostek, believes cellular phones could be the video cassette recorders of the late 'Eighties if the price fell fast enough. Right now, however, the phones are like the Betamax in the mid-Seventies, poised—seemingly permanently—on the brink of success.

The full cost of a typical cellular telephone—monthly financing, installation and service charges, has been cut nearly in half in two years, but it still runs more than \$150 a month in most cities. At that price, it's hard to overcome the sales resistance of people who use beepers and pay phones, or who just don't care that much about staying in touch with the office.

What's worse, Shostek warns that much of the price decline is over. The price of equipment dropped dramatically last year because Japanese equipment producers listened to Shostek's competitors in the consulting business and overestimated the size of the U.S. market. He reckons that early in 1985, a year's supply of mobile phones was sitting in warehouses.

Now, however, that supply

Continued on Page 29

### Introducing

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Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Telephone \_\_\_\_\_  
Value Line, Inc. (Manager) Dept. 514N21



banks. In any case, you are paying nothing for a large bank. And it is impossible to really tell if they increased their reserves sufficiently and so on.

But talk about value! This is real value! And it is selling at a yield of 6%. It is about nine times last year's earnings, and maybe eight times this year's earnings. And the rather imperious chairman told us that they didn't see any reason why it should grow at 19% a year as it has over the last 10-15 years. Now, that is anybody's guess. I just think, in terms of value and a big broad play on the market, it is hard to do much better.

*Q: Let's go back to your portfolio of 10 global stocks. How many of these would you put into it?*

A: The way I feel right now, I'm suffering from a little acrophobia in some of these other markets. Of 10 stocks, at this point, I would have four of them from Hong Kong. In a broader global portfolio, we would have 10%-12% of our assets in Hong Kong. I can't see any place that looks as attractive. The only thing that can go wrong is that if we are wrong about an economic recovery in the industrial world, Hong Kong is going to flop. It is an export economy, and has got to have the export demand.

The thing that I like best, though, is that I don't think there is a lot of risk in the Hong Kong market.

*Q: Anything else about your trip that struck you?*

A: I really was struck by the interrelationships of currencies. People really haven't focused on how these Southeast Asian currencies are linked to the dollar, that the decline in the dollar has really improved their competitive position.

An economy like Hong Kong's which was a net loser from high oil prices, really has a lot going for it here, with lower interest rates, lower oil prices, and a lower dollar. Southeast Asia is an exciting area. And it is clear to me that Singapore is not the way to play right now. It may be later, but not now. Hong Kong is.

*Q: Singapore no, Hong Kong, yes.*

A: The thing about Singapore is—I guess I should say it—that the contrarians are attracted to it because the market is down. Just the fact that it is down in a worldwide bull market, really has attracted contrarian buying—from very successful contrarians.

*Q: We might add that contrarians have been shorting our markets. So maybe this ain't the year for contrarians.*

A: That's right. I really wanted to make the case for Singapore, because you have to admire them as a people and for their system. But I can't do it.

*Q: Well, if you can't do it, we doubt the case can be made. Thanks, Barton.*

## Cellular Radio

Continued from Page 15

has been largely worked off. The Japanese producers have been hit with anti-dumping charges before the U.S. International Trade Commission. And the dollar buys 30% less in Japan than it did a year ago. So Shostek projects only moderate price declines for equipment over the next few years.

As for service, competition can be expected to drive charges

down, since the Federal Communications Commission mandated two competing systems in every city, one run by a local telephone company, one run by somebody else, usually a coalition of paging companies.

But Shostek notes that competition is likely to drive prices only to a level near actual costs, and he warns that big-city cellular systems are costing

more than anyone expected.

In a new survey of cellular systems, Shostek has discovered a disquieting trend: Cellular has not delivered the theoretical capacity expected, because customers aren't so obliging as to spread themselves out over a metropolitan area. Instead, they congregate in certain cells at certain hours of the day.

"Los Angeles has three freeways converging at a single point. Rush hour comes, and traffic stops. It's a great time to get on the phone." When users are concentrated like that, a system that could theoretically

handle 100,000 customers overlaid at only a fifth of "capacity."

Just as bad, according to Shostek, are the problems of radio transmission in the concrete-and-steel canyons of the biggest cities. Echoes and signal bounces produce hot spots and dead spots. Such radio difficulties put a heavy load on a cellular system's central switch, which must transfer a conversation from cell to cell many more times than would be needed in a place with little interference.

The only solution is to add

Continued on Next Page



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## The Most Promising Markets

Market	Expected demand for Population cellular phones (thous.)			Market	Expected demand for Population cellular phones (thous.)		
	1985	1990			1985	1990	
New York	13,700	43,700	131,000	Cleveland-Akron	2,783	3,700	17,200
Los Angeles	11,615	51,900	154,000	Atlanta	2,393	5,400	24,200
Chicago	7,854	26,500	83,600	San Diego	2,085	4,800	21,200
Philadelphia	4,770	11,400	39,500	Denver	1,824	5,100	21,900
Detroit	4,718	10,000	34,900	Milwaukee	1,390	2,700	11,400
Boston	3,678	13,500	45,600	Tampa	1,837	800	7,300
San Francisco-San Jose	5,119	19,700	65,600	Cincinnati	1,541	2,100	9,600
Washington-Baltimore	3,379	11,600	46,000	Kansas City	1,473	3,700	14,800
Dallas	3,595	12,200	46,500	Buffalo	1,210	1,300	6,300
Houston	2,399	4,500	19,100	Phoenix	1,736	2,000	11,300
St. Louis	2,898	6,200	26,500	Indianapolis	1,199	1,700	8,000
Miami	2,377	2,100	11,400	New Orleans	1,338	1,100	6,500
Pittsburgh	2,218	6,800	26,900	Portland	1,349	1,900	9,600
Minneapolis							

The table provides Herschel Shostek's estimates of what demand existed for cellular phones last year in the top 30 markets and what it will be in 1990, based on wealth, number of businesses and population growth.

### Cont. from Preceding Page

averaging \$15 per resident of a big city market. But others are paying high prices, including Mobile Communications Corp. of America, Lin Broadcasting, the McCaw Communications subsidiary of Affiliated Publications, and, among telephone companies, BellSouth and Pacific Telesis.

For example, Mobile Communications Corp. of America, backed by BellSouth, agreed to buy 85% of American Cellular Telephone Corp. for a price that reflected about \$30 a head for access to residents of Los Angeles. The price may reflect MCCA's acquisition of a controlling interest in the Los An-

geles operation. Similarly, US-West has bid \$24 a head, plus \$5 more in anticipated construction costs, for a Communications Industries franchise in San Diego.

Lin Broadcasting found lower prices, which, however, would have seemed high two years ago. Lin added to its controlling interests in Dallas and Houston recently by paying \$10 and \$13.75 a head, respectively. Lin lost \$4 million, or nearly 15 cents a share after tax, last year on cellular and is expected to lose more in 1986, in part because the costs of getting customers signed up exceed early revenues. But on the assumption that higher costs today mean higher earnings tomorrow, the market accords Lin a lofty multiple of 31 times earnings (which takes into account positive income from broadcasting).

Shostek is slow to knock such deals, since he does believe that cellular will someday be a fine and profitable business. "I wish I could sell out now; I wish I had something to sell out. It's not very often that you can get several thousand percent return in one or two years. However, that doesn't mean the people who are buying in now are fools. Over the long term—and I'm talking about 10 years—there will be a substantial profit, which makes a \$10-\$20 investment not unreasonable."

But Herschel Shostek has a reputation to uphold, so he adds: "A lot of them are in for disillusionment. Unless you have very deep pockets, you can't afford to be a part of it."

## Gains in Quarterly Net At Tobacco Companies

Philip Morris Cos. said last week that first-quarter profits spurred 23% over a year ago, while R.J. Reynolds Industries Inc. posted a 13% gain in income.

The results reflect generally strong performances in the companies' food and tobacco businesses, as well as major acquisitions that they made last year.

Philip Morris said net income for the three months ended March 31 came to \$316 million, or \$1.32 a share, compared with \$256 million, or \$1.06 share. Revenues soared 78.7% to \$5.92 billion from \$3.31 billion.

Reynolds said its net income for the three months ended March 31 came to \$206 million, or 66 cents a share, compared with \$182 million, or 66 cents a share, a year ago.

Per-share earnings were unchanged because of dilution of 19 cents a share in the most recent quarter, a result of the company's acquisition of Nabisco Brands Inc. for \$4.9 billion in mid-1985.

Nabisco Brands' first-quarter results generally reflected strong performances in all of its major operating units.

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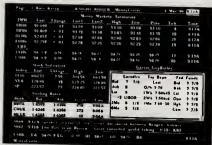
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## NY Court Kills FCC Strictures On Dial-A-Porn

By Leonard Heymann

NEW YORK — A federal appeals court in New York has set aside FCC rules that would have restricted minors from gaining access to "dial-a-porn" message services, but did not prevent the commission from enacting the same regulations in other states.

The rules, requiring either a credit card or personal identification number (PIN) to access the adult-messages services, are unworkable in New York Telephone (Continued on Page 37)



JOINING TOGETHER: Charles Skibo, David Hann and Donald Prigmore, presidents of US Telecom, GTE Telenet and GTE Sprint, respectively, talk about how US Sprint will fly despite GTE Sprint's losses. Story on Page 4.

## Brown Chairs Last Annual Meeting; No Successor Named

By Anna Zornosa

SAN FRANCISCO — Charles L. Brown, 65, AT&T's chairman since 1979, swung the gavel for the last time at the 131st annual meeting last Tuesday, bidding farewell to the company's shareholders. He will retire in August.

Brown laced his comments to stockholders and the press with references to his accomplishments during his seven-year tenure. But he disappointed analysts who predicted he'd tip his hand about who will be named to succeed him.

Though Brown maintained his composure as he recounted his stewardship of the company during its pivotal years, his wife, Ann Lee Brown, had told employees that the departure was triggering deepfelt emotions.

Speaking after her husband at an employee meeting the night before, she

expressed how difficult the prospect of chairing his last meeting was for Brown. She said he had chosen not to express his feelings to employees personally for fear he would cry, according to an AT&T employee present.

The Browns regard AT&T as their family and wish they did not have to leave in August, she said. Brown's parents worked for AT&T. His father worked for AT&T Long Lines for 37 years and his mother was a Long Lines operator supervisor. AT&T rules mandate retirement at the age of 65.

Brown looked haggard at the shareholders' meeting. His eyes bore heavy bags and his usual curt manner during press conferences was even more accentuated. One employee attributed his appearance and demeanor to

(Continued on Page 6)

## IBM Links S/370, S/36 To Token Net; Enhances Software

By Laurel Nelson-Rowe

RYE BROOK, N.Y. — IBM last week took the next major step in connectivity for its Token-Ring Network, bringing the System/370 mainframe and System/36 departmental minicomputer into the fold of systems that connect directly to the local-area network.

In the first flurry of Token-Ring Network follow-ons since the network's debut last year (Communications Week, Oct. 21, 1985), IBM also unveiled a second version of the Token-Ring Network PC Adapter, the add-in-board that links PCs to the LAN, to support IBM Industrial Computers. Other hardware additions

(Continued on Page 37)

## Small Cellular Mkts. Get Hot

By Steven Titch

In the nation's largest cities cellular telephones have become so commonplace that the image of a businessman wheeling through rush hour traffic with a phone in his hand no longer turns many heads.

But in smaller markets cellular remains a novelty, if it exists at all. That means new opportunities for system operators, their customers—and for rubberneckers not yet conditioned to the sight of those one-handed drivers.

The smaller markets also represent new opportunities and challenges for transmission equipment vendors. Scaled-down systems for

smaller markets are the emerging trend in cellular radio telephone systems, as equipment vendors seek to satisfy the needs of cellular radio operators demanding economical networks they can bring on line quickly.

And that demand for smaller systems has provided a forum for start-up suppliers to challenge the leaders—Motorola Inc., AT&T, Northern Telecom Inc. and

Ericsson Radio Systems Inc.—with economical, low-end cellular switching gear aimed at wireline (telco-owned) and non-wireline carriers. Robust competition and enhanced sales of stand-alone systems in

(Continued on Page 21)

## Close Up Cellular Switching Systems

Ericsson Radio Systems Inc.—with economical, low-end cellular switching gear aimed at wireline (telco-owned) and non-wireline carriers. Robust competition and enhanced sales of stand-alone systems in

## PROFILE

### COS President A Real General



Communication Week Photo by Bob Seaton  
Faurer, COS's three-star general ready for the 'challenge.'

By Laurel Nelson-Rowe  
ALEXANDRIA, VA. — He's left behind the three-star epaulettes, the spit-shined shoes and the tendency to salute instead of shaking hands, but other vestiges of a 35-year military career are still quite evident in Lincoln Faurer, the new president of the Corporation for Open Systems.

Introduced as "the General," the retired Air Force officer has shrugged his uniform for conservative suits and white shirts. But while the surface details have changed, Faurer intends to use the discipline, tactics, diplomacy and management expertise he gained in decades of military assignments to help make COS an influential world force.

Harnessing the resources of COS' membership—upwards of 41 computer and communications equipment manu- (Continued on Page 36)

## Cellular Groups Jockey For Lottery Positions

By Steven Titch

WASHINGTON — Three non-wireline cellular settlement groups last week were rushing to complete a merger agreement in time for this afternoon's FCC lottery for markets 121 to 135.

The maneuvers—bewildering as the IRS tax code, as much a gamble as a keno card—are in response to FCC rules that have undergone frequent and fundamental changes since the agency started awarding cellular permits several years ago.

Last week's frenzied activity reflected investor anxiety as thousands of cellular applicants competed for a handful of cellular permits. For many players, joining a settlement group seems the only hope of getting a piece of the action—tiny though the pieces may turn out to be.

Members of a settlement group agree that whichever one of them wins the lottery will sell slightly less than half its construction permit to the remaining group members. The FCC requires that the winner retain a majority interest.

According to David Bednarsh, president of Mobile (Continued on Page 36)

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## New Small Switch Vendors Heat Cellular Competition

(Continued from Page 1)  
small markets may be a consequence of these vendors' emergence.

Most wireline carriers have gotten off to substantial headstarts over their non-wireline competitors in the top 90 U.S. cellular markets, almost all of which have service. And mobile telephone switching offices (MTSOs) and their accompanying radio-frequency (RF) gear are either installed or on order in some smaller cities.

Likewise, many non-wirelines in the top 90 markets have already ordered their systems, even though some large non-wireline contracts in the top 30 are still up for grabs. Those awards will probably come later this year.

But in markets smaller than the top 90, the field is still virtually wide open for equipment vendors. Further, the geographic and economic considerations of the smaller markets provide a dimension of design flexibility not found in larger cellular markets.

Cellular operators have three options when building a system for smaller markets (CommunicationsWeek, March 24). If the city adjoins or is close to a larger one—the case with Reading, Pa. and Philadelphia—cell sites in the smaller city can be built to transmit, or "backhaul," calling traffic to the high-capacity switch of the larger city via long-distance lines. That way there is no local switching intelligence; all calls are processed by the big-city switch.

A second option is a remote switching unit (RSU) in the smaller city, driven by a large switch in the larger city. The RSU handles call-switching functions for the smaller city but leaves to the MTSO the major processing operations,

such as collection of billing data, traffic analysis and diagnostics.

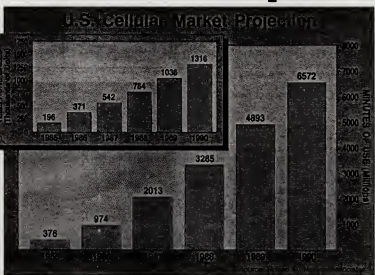
The third option is a self-contained, stand-alone system. Though the initial investment can be as high as \$5 million, prices appear to be declining. This option thus presents an increasingly attractive choice, especially for wirelines, in light of the rising costs for backhaul.

Bell companies have typically adopted one of the first two options and have made their largest cities hubs for cellular operations. For instance, Ameritech Mobile Communications Inc., Schaumburg, Ill., operates a Flint, Mich., cellular network, using capacity from its Detroit system. Southwest Bell Mobile Systems Inc., Dallas, operates San Antonio, Texas, from its MTSO in Dallas.

Almost all carriers begin with the first option, backhauling cellular traffic in small cities to the hub cities. Experts examining the often grim demand forecasts for the below-top-90 market generally predict that backhauling would predominate indefinitely.

A Robert R. Nathan Associates Inc. report released earlier this year, for example, predicted that only 37 markets below the top 90 would be able to support two carriers. Nathan, a Washington-based analysis firm, said that to be viable those two carriers would have to backhaul calling traffic, because system procurement in such a case would be economically unfeasible (CommunicationsWeek, Feb. 24).

System engineers at Ameritech undoubtedly had this forecast as well as others in mind when they began service in Dayton, Ohio, by backhauling to a Northern Telecom switch in Colum-



bus. In only a few months, however, subscribership had mushroomed to more than 1,000, and long-distance costs mounted.

Ameritech was proceeding with plans to cut over a remote switch to handle the increasing traffic when Northern approached it with a counter offer: a scaled-down version of Northern's MTX switch, configured especially for smaller applications, at the same cost as the remote. Ameritech agreed and the new switch was placed in operation.

The MTX-M (M for Mini), was Richardson, Texas-based Northern's answer to what appears to be a serious assault by two smaller companies, CTI Inc., Corinth, Miss., and Quintrone

Corp., Quincy, Ill.

The established suppliers remain dominant. But CTI's and Quintrone's scaled-down equipment, often requiring an initial investment of less than \$1 million, is shaping up as a threat in the small-systems market—a market which, according to analysts, did not exist six months ago.

For example, NewVector Communications Inc., a subsidiary of U S West Inc. but operating as a non-wireline in Omaha, Neb., has just selected a CTI switch, which uses E.F. Johnson radio and base-station equipment. NewVector also just recently cut over a Quintrone system it had been testing in

(Continued on Page 22)

## Motorola Leads Small Pack Of Cellular System Makers

By Steven Titch

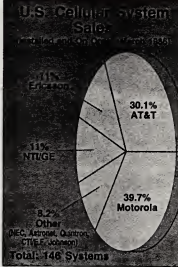
Call Motorola Inc. the leader of the cellular vendors pack. Primarily because it has the widest array of equipment and a solid record in mobile communications systems, Motorola has won the largest number of contracts—58, with 38 of those in operation by the end of March.

Motorola has been particularly strong among non-wirelines, where key contracts include Cellular Telephone Co. New York; Cellular One, Washington; and Gencom Cellular Inc., Atlanta. Motorola is also principle supplier to GTE Mobimet Inc., Houston; United TeleSystems Inc., the cellular arm of Kansas City-based United Telecommunications Inc.; and Centel Cellular Inc., Chicago.

In addition, Motorola has sold small systems to BellSouth Inc., Atlanta; Nyxnet Mobile Communications Inc., Pearl River, N.Y.; and Southwestern Bell Mobile Systems Inc., Dallas. Even so, its overall penetration of the Bell market has been minimal.

Doing the busiest Bell business is

AT&T, which has clinched 44 contracts and brought 38 systems on line. Most of those have been Bell; AT&T has had little success on the



non-wireline side. Its one major non-wireline contract, for three systems with McCaw Cellular Communications Inc., Bellevue, Wash., may prove a windfall. McCaw bought MCI Airsigna's cellular holdings and now controls several more markets in the top 30 in which contracts are still to be awarded.

AT&T's primary competitor for wireline business is Northern Telecom Inc., Richardson, Texas. Northern has teamed its switch with General Electric Co.'s cellular radio frequency (RF) gear to provide a turnkey system. Northern is primary vendor to NewVector Communications Inc., a U S West subsidiary, and has made inroads with the other BOCs. So far it has 16 contracts with 14 systems in operation.

Ericsson Radio Systems Inc. has major non-wireline pacts with the Cellular One companies in Chicago, Detroit, San Francisco and Buffalo. Radio Systems is a unit of Ericsson Inc., the U.S. subsidiary of LM Ericsson Telephone Co., Sweden, the worldwide leader in cellular system sales.

Ericsson's presence in those Cellular One cities has enabled it to scoop up non-wireline business in the surrounding areas for a total of 16 contracts. Delays on the non-wireline side, however, have resulted in cutover of only three Ericsson systems.

Astron Corp., Lake Mary, Fla., a joint venture of Stromberg-Carlson Corp. and Japan's Mitsubishi Electric Corp., was plagued by a slow start and has only made three sales. NEC America Inc.'s Switching Systems Division, Richardson, whose Japanese parent supplied Nippon Telegraph & Telephone Public Corp. with the world's first cellular system, has four U.S. contracts.

Start-ups Quintrone Corp., Quincy, Ill., and CTI Inc., Corinth, Miss., have sold one system each.

In the also-ran category comes Harris Corp.'s RF Communications Sector, Rochester, N.Y., which sold three systems before bowing out of the switching market late last year. Another casualty was ITT Network Systems, Raleigh, N.C., which failed to sell any cellular MTSOs.



# Smaller Cellular Markets Represent New Challenges,

(Continued from Page 21)  
Albuquerque, N.M.

Non-wirelines are generally considered more cost-conscious than their richer telco counterparts. But what's often forgotten is that though one Bell company may operate several systems, each operation is a separate partnership entity accountable to diverse owners. NewVector may operate Seattle and Omaha, for instance, but one cannot subsidize the other.

So cost is an important consideration, even for a telco, said Jerry Wolfer, NewVector's director of operations. "We do whatever makes economic sense," Wolfer said.

"Our attitude is to go in as cheaply as possible," said Tom O'Malley, assistant vice president of system development at Southwestern Bell Mobile Systems. This involves studying construction costs, real estate acquisition and backhaul costs, which, if not figured properly, "can kill you," O'Malley said.

Though Southwestern Bell has thus far procured its cellular gear from AT&T Network Systems, Morristown, N.J., and Motorola, Schaumburg, the company will be considering bids from a new list of suppliers—including Quintrone—for systems in Southwestern's smaller markets, O'Malley said.

Kevin Colosia, marketing manager for cellular system products at Motorola's Systems Division, sees two segments in the wireline market. "There are the larger independents that are spread across the country and then there are the BOCs, which have a strong regional presence," Colosia said. "I anticipate the regional companies will try to maximize their franchised areas."

Motorola is addressing the entire cellular market, from its EMX-2500 high-capacity digital MTSO down to its recently-introduced EMX II, whose capacity is limited to four cells and 54 voice channels. This switch, however, will not be available until 1987, placing Motorola at a competitive disadvantage. Motorola's EMX-2500 is a cellular version of the DEX600 tandem switch manufactured and supplied to Motorola by Digital Switch Corp., Plano, Texas.

Motorola maintains an advantage, however, with its installed base of MTSOs and, of late, its ability to network its switches. This capability, known as Distributed Mobile Exchange (DMX), provides automatic transfer of data between Motorola switches. Thus cellular subscribers on a Motorola system are able to retain features such as call forwarding and three-way calling when traveling in other cities where the cellular system employs Motorola MTSOs.

DMX will ultimately lead to switch-to-switch "handoffs," in which a moving caller can drive out of one market and into another without interrupting the call. DMX has been implemented already in Motorola's U.K. system and Colosia predicts it will be used in the United States very soon. "We see a heavy presence in the Northeast corridor," he said.

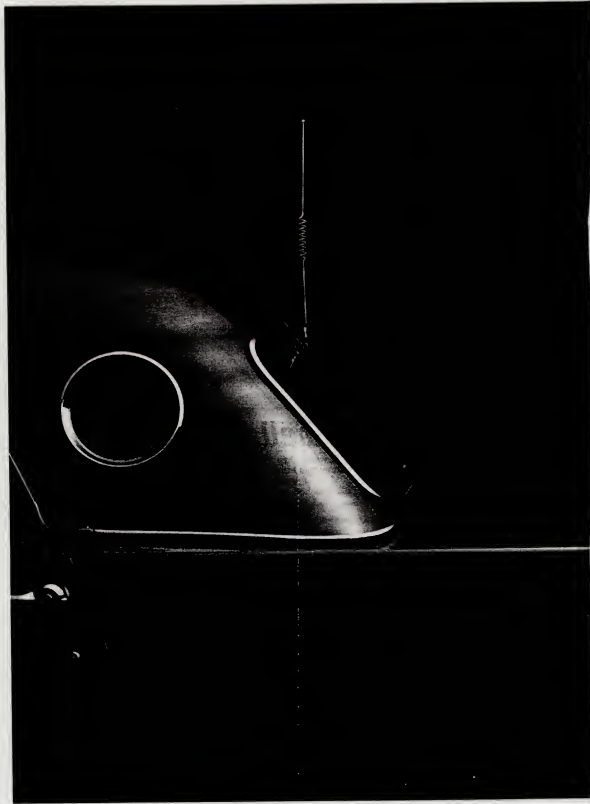
Northern Telecom expects to have switch-to-switch hand-off capability available by August, according to Leonard McCoy, senior account manager for cellular mobile telephone service. "We expect this to be a strong factor with the 90-plus markets," McCoy said. Northern's method also provides operators with call-traf-

fic tracking and breakdown on a cell-by-cell basis, enabling operators to note patterns in usage and project capacity requirements.

Still, the size of Northern's MTX-M, with a minimum of 96 ports, may be too large to compete effectively with smaller and less expensive gear.

AT&T, with only two models—the Autoplex 10 and the

Autoplex 100—gives every indication it will not be pursuing the small system market, choosing instead to work with its BOC customers at expanding existing systems to cover wider areas. Examples include Bell Atlantic Mobile Systems' so-called Supersystem, linking Autoplexes in Philadelphia, Wilmington, Del., and Atlantic City, N.J.





# New Opportunities For System Equipment Vendors

At a recent trade show, Cynthia Zey, department chief for cellular systems at AT&T Network Systems, said the company would adopt this expansion policy throughout the smaller MSAs. Zey was unavailable for this report, but Sophia Petrow, product planner for AT&T Network Systems, said AT&T has not made a final decision concern-

ing marketing or product plans in the small markets.

Petrow did say that AT&T plans to make Autoplex-to-Autoplex handoff capability available later this year.

## Seeking Standards

The Electronic Industries Association has been unable so far to arrive at standards that would allow handoffs

among competing manufacturers' switches.

Most suppliers remain reluctant to share proprietary information, despite having submitted engineering proposals. Optimists see a protocol emerging by the end of this year; pessimists don't expect real progress much before 1987 or 1988. The one thing both sides agree about is that

a universal protocol must be developed for cellular to become a truly nationwide mobile communications network.

Ericsson has switch-to-switch networking in the engineering phase but no specific availability date, said Barry Kratz, Ericsson's director of operations. Like AT&T, Ericsson has no specialized stand-alone equipment aimed at op-

erators in small markets. Its stand-alone technology is based on backhaul alternatives.

Using a major contract in Detroit as an anchor, for example, Ericsson is now building systems for non-wirelines in Lansing, Mich., and Toledo, Dayton and Columbus, Ohio. All will share Detroit's switch. Observers believe the company will follow this format in the smaller markets around San Francisco, Chicago and Houston, where Ericsson has also won non-wireline contracts.

One cost advantage that Ericsson is exploiting is the non-wirelines' ability to construct and operate their own long-haul lines. The BOCs are prevented by the AT&T divestiture agreement from providing service across LATA (local access transport area) boundaries. Those restrictions, however, probably won't last forever. Several Bell companies already have waiver requests pending before U.S. district judge Harold H. Greene on this matter. The BOCs argue that, for cellular, the inter-LATA restriction is competitively injurious.

Smaller suppliers Quintron and CTI agree with other vendors that cost is a major priority among carriers. Yet, unlike Ericsson and AT&T, they believe operators also seek the greater degree of control that a stand-alone switch affords.

"The technological advantage of a stand-alone switch is serviceability without dependency," said Glen Teason, cellular sales manager for Quintron.

Both Quintron and CTI use the modular concept—building up a smaller system, instead of borrowing down from a larger one. Both companies can offer starter systems of two or three cells for under \$1 million.

Jim Davis, senior staff engineer for cellular hardware at CTI, scoffs at the notion that cellular will not make it to the small markets. "I think all wirelines will put a system online," he said. "At some point, even in the small markets, that [radio] spectrum will be a valuable commodity."

Quintron's Teason is equally upbeat. "Our system is economical due to its modularity," he said. "We custom-tailor hardware and software for unique applications. Each type of carrier has its special needs. We try to hit their 'hot button.'"

In addition to its stand-alone switch, Quintron offers operators a variety of alternatives, including cell sites with compact, often pole-mounted equipment especially economical for highway corridors, Teason said.

Both companies are vigorously marketing to wirelines and non-wirelines, which they see as having similar needs, albeit different ways of doing business.

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SUBSCRIBERS	98,000	320,000	226.5
REVENUE	\$ 178,000,000	\$300,000,000	71.9
CAPITAL INVESTED	\$ 354,761,000	\$911,167,000	156.8
SITES	346	913	163.9
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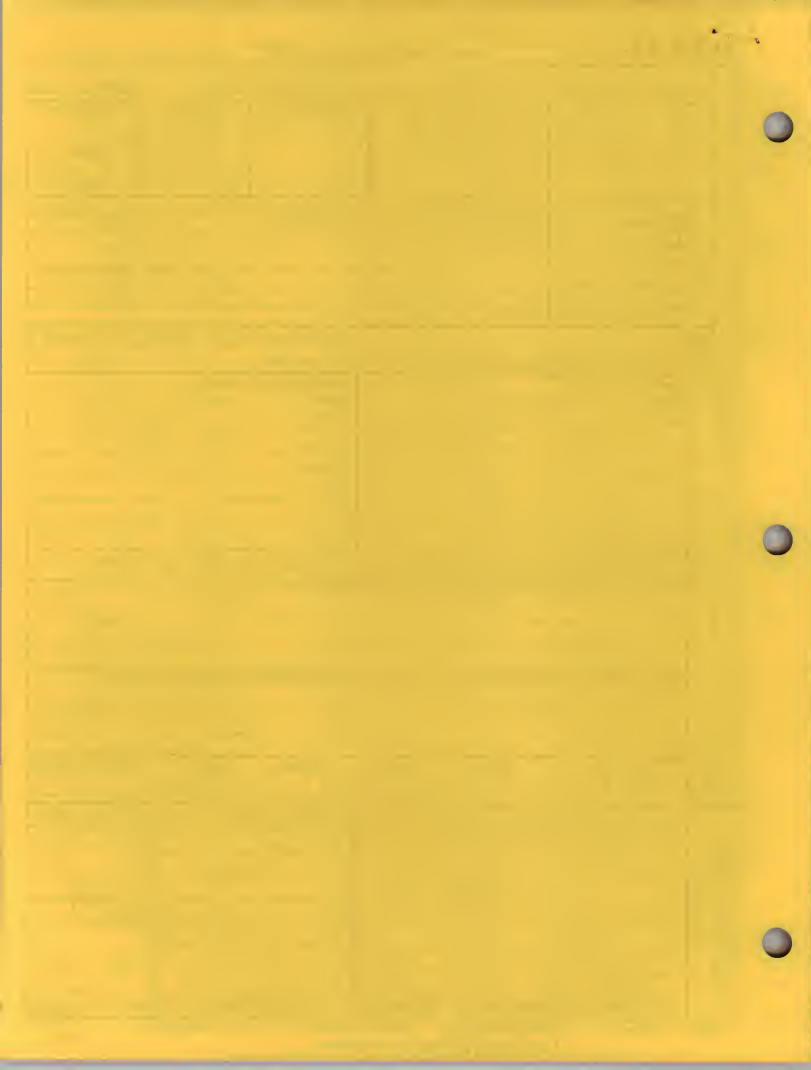
10/80



# INPUT

## ORDER/INVOICE/FULFILLMENT

ORIGINATOR (SIGNATURE) _____		PREPARED BY: _____		DATE: _____						
ACTIVITY	<input type="checkbox"/> NEW ORDER <input type="checkbox"/> CONTINUATION <input type="checkbox"/> CHANGE <input type="checkbox"/> CANCEL <input type="checkbox"/> SPECIAL:	<input type="checkbox"/> FULFILLMENT ONLY <input type="checkbox"/> SINGLE INVOICING <input type="checkbox"/> MULTI-INVOICING: NO. INVOICES <u>2</u> <input type="checkbox"/> PENDING:	COMMISSION TO: _____ % _____ % _____ % _____ %	SOLD BY: _____ % _____ % _____ % _____ %	APPROVED  INITIAL _____ DATE _____					
PRODUCT	<input type="checkbox"/> SUBSCRIPTION <input type="checkbox"/> CUSTOM <input type="checkbox"/> MULTICLIENT <input type="checkbox"/> REPORTS <input type="checkbox"/> COPIES <input type="checkbox"/> CONSULT./PRESENT. <input type="checkbox"/> TAPES/MATERIALS <input type="checkbox"/> REIMBURSED COSTS	US <input checked="" type="checkbox"/> UK <input type="checkbox"/> PROJ. ID./YEAR _____ _____ _____ _____ _____ _____	TITLE OR DESCRIPTION _____ _____ _____ _____ _____ _____		AMOUNT _____ _____ _____ _____ _____ _____					
CLIENT AUTH. P.O. # _____ INPUT CONTRACT <input type="checkbox"/> LETTER <input type="checkbox"/> VERBAL <input type="checkbox"/> ATTACH ALL AUTHORIZING DOCUMENTS TO WHITE (CONTRACT) COPY.										
ORIGINATOR	SHIP TO: * NAME _____ TITLE _____ COMPANY _____ ADDRESS _____ _____ _____ PHONE ( ) _____		INVOICE TO: (IF DIFFERENT) NAME _____ TITLE _____ COMPANY _____ ADDRESS _____ _____ _____ PHONE ( ) _____							
	* <input type="checkbox"/> Check here if more than one shipping address and attach names and addresses to green (fulfillment) copy.         * <input type="checkbox"/> Check here for address change to mail list.									
	INVOICE TO READ: (FOR OTHER THAN STANDARD WORDING)									
SPECIAL INSTRUCTIONS FOR HANDLING, BILLING, STAGGERED OR DELAYED PAYMENTS, ETC. <u>15-10017</u> _____ _____										
O.I.F. ONLY	INV. COMP. _____	BY: <u>RF</u>	DATE: <u>6/1/86</u>	CLIENT #:	ORDER #: <u>5172</u>	INV. #: <u>13007</u>	MULTI-INVOICING _____ OF _____			
ORIGINATOR/SHIPPING	FULFILLMENT	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE	ITEM DESCRIPTION OR TITLE	NO.	BY	DATE	
FULFILLMENT TO BE COMPLETED IN: <input type="checkbox"/> PALO ALTO <input type="checkbox"/> LONDON <input type="checkbox"/> OTHER _____										



# GTEDS SCREEN

INCLUDED BY GTEDS MANAGEMENT REQUEST

COMPANY NAME Computer Horizons

ADDRESS \_\_\_\_\_

PHONE # \_\_\_\_\_

PRESIDENT \_\_\_\_\_

PUBLIC or PRIVATE Public, NASDAQ, approximately 2.5 MM shares out

SERVICES OFFERED Systems design, architecture, programming

REVENUE \$50.9 MM for year ended 2/28/86

EMPLOYEES 754

INDUSTRY MARKETS Communications, Finance, Other (mfg. & Fed. Gov't)

GEOGRAPHIC MARKETS 21 Offices nationwide, heavy concentrations  
of revenue in Northeast and Orlando, Florida

SUMMARY Fast growing until 1985, CHRZ originally specialized in  
telecommunications (AT&T) and Finance (banking & brokerage).  
Recent trend has been to emphasize manufacturing and Federal  
government in face of slower growth in primary areas. Profitability  
above industry average but decaying of late. Productivity about  
average, as is ROA. Best financial performance in 1984.  
Stock is extremely volatile and thinly traded. Drexel Burnham  
has acted as a market maker and syndicator. Emphasized geographic  
expansion until recently. New emphasis on searching out small P.S.  
for acquisition by CHRZ.

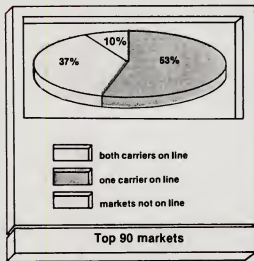


for Don.

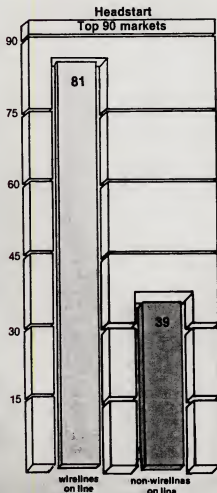


## STATUS REPORT

Key: W—wireline carrier. NW—non-wireline carrier. CPG—construction permit granted. Information available as of March 28, 1986.



Markets On Line



MSA #/Name	System Operators	Status	# Calls	Switching Equipment
1 NEW YORK	W—Nynex Mobile NW—Metro One	On line 6/15/84 On line 4/5/86	48 24	AT&T Motorola
2 LOS ANGELES	W—PacTel Mobile Access NW—LA Cellular Telephone	On line 6/13/84 CPG 12/4/84	29 24	AT&T Motorola (I)
3 CHICAGO	W—Ameritech Mobile NW—Cellular One	On line 10/13/83 On line 1/3/85	44 18	AT&T Ericsson
4 PHILADELPHIA	W—Bell Atlantic Mobile NW—Metrophone	On line 7/12/84 On line 2/12/86	32* 18	AT&T Motorola
5 DETROIT	W—Ameritech Mobile NW—Cellular One	On line 9/21/84 On line 7/30/85	19 15	AT&T Ericsson
6 BOSTON	W—Nynex Mobile NW—Cellular One	On line 1/1/85 On line 1/1/85	20 10	AT&T Motorola
7 SAN FRANCISCO	W—GTE Mobinet NW—Cellular One	On line 4/2/85 CPG 8/9/84	25* 27	Motorola Ericsson
8 WASHINGTON	W—Bell Atlantic Mobile NW—Cellular One	On line 4/2/84 On line 12/16/83	36* 25*	AT&T Motorola
9 DALLAS	W—Southwestern Bell Mobile NW—Metrolinx	On line 7/31/84 On line 3/1/85	41 26	AT&T Motorola
10 HOUSTON	W—GTE Mobinet NW—Houston Cellular Telephone	On line 9/28/84 CPG 12/27/84	8 29	Motorola Ericsson
11 ST. LOUIS	W—Southwestern Bell Mobile NW—CyberTel	On line 7/16/84 On line 7/16/84	17 13	AT&T Motorola
12 MIAMI	W—BellSouth Mobility NW—Florida Cellular Telephone	On line 5/25/84 CPG 4/26/85	23* 16	AT&T NTI/GE
13 PITTSBURGH	W—Bell Atlantic Mobile NW—Cellular One	On line 12/10/84 CPG 3/6/84	20 17	AT&T Astronet
14 BALTIMORE	W—Bell Atlantic Mobile NW—Cellular One	On line 4/2/84 On line 12/16/83	35* 25*	AT&T Motorola
15 MINNEAPOLIS	W—NewVector Communications NW—MCI/Cellcom	On line 6/6/84 On line 7/23/84	13 9	NTI/GE NTI/GE
16 CLEVELAND	W—GTE Mobinet NW—Cellular One	On line 12/18/84 On line 5/31/85	11 7	Motorola NTI/GE
17 ATLANTA	W—BellSouth Mobility NW—GenCom Cellular of Atlanta	On line 9/5/84 CPG 1/18/85	12 10	AT&T Motorola (I)
18 SAN DIEGO	W—PacTel Mobile Access NW—GenCom	On line 8/15/85 CPG 3/7/85	8 8	AT&T Motorola
19 DENVER	W—NewVector Communications NW—Cellular One	On line 7/10/84 CPG 1/31/85	10 11	NTI/GE NEC (I)
20 SEATTLE	W—NewVector Communications NW—Cellular One	On line 7/12/84 On line 12/12/85	13 15*	NTI/GE AT&T
21 MILWAUKEE	W—Ameritech Mobile NW—Milwaukee Telephone Co.	On line 8/1/84 On line 6/1/84	7 7	AT&T Motorola
22 TAMPA	W—GTE Mobinet NW—Bayfone	On line 11/30/84 CPG 4/26/85	10 10	Motorola
23 CINCINNATI	W—Ameritech Mobile NW—Southern Ohio Telephone	On line 1/15/84 CPG 1/5/85	13 13	AT&T Ericsson
24 KANSAS CITY	W—Southwestern Bell Mobile NW—Cellular One	On line 8/14/84 On line 3/14/86	13 12	Motorola AT&T
25 BUFFALO	W—Nynex Mobile NW—Buffalo Telephone	On line 4/16/84 On line 6/1/84	7 9	Motorola Ericsson
26 PHOENIX	W—NewVector Communications NW—Metro Mobile CTS	On line 8/15/84 On line 3/1/85	9 10	NTI/GE Motorola
27 SAN JOSE	W—GTE Mobinet NW—Cellular One	On line 4/2/85 CPG 8/9/84	24* 27	Motorola Ericsson
28 INDIANAPOLIS	W—GTE Mobinet NW—Indianapolis Telephone Co.	On line 5/3/84 On line 2/3/84	5 9	Motorola Motorola
29 NEW ORLEANS	W—BellSouth Mobility NW—Radiofone	On line 8/1/84 On line 9/6/85	5 5	Motorola Motorola
30 PORTLAND	W—GTE Mobinet NW—Cellular One	On line 3/5/85 On line 7/12/85	5 7	Motorola AT&T

\*—Includes Washington, DC, and Baltimore.

\*—Includes Seattle and Tacoma, WA.

\*—Includes San Francisco and San Jose, CA.

I—Indicated in filing but no contract.

\*—Includes Philadelphia, Allentown, PA, and Wilmington, DE.

\*—Includes Miami and W. Palm Beach, FL.







The material for this listing has been collected from the FCC and system operators. If you have new or additional information not yet listed here, please call Kenda Richardson, associate editor, at 913-888-4664.

MSA #/Name	System Operators	Status	# Calls	Switching Equipment
31 COLUMBUS OH	W - Ameritech Mobile NW - Cellular One	On line 5/30/85 CPG 1/28/85	5	NTI/GE Ericsson
32 HARTFORD CT	W - Southern New England Tel. NW - Hartford Cellular Co.	On line 1/15/85 CPG 2/14/85	6	AT&T Motorola
33 SAN ANTONIO TX	W - Southwestern Bell Mobile NW - San Antonio Cellular Tel.	On line 6/14/85 CPG 1/30/85	12	AT&T
34 ROCHESTER NY	W - Rochester Telephone NW - Genesee Telephone Co.	On line 6/14/85 CPG 1/30/85	5 7	AT&T Ericsson
35 SACRAMENTO CA	W - PacTel Mobile Access NW - Sacramento Cellular Tel.	On line 6/29/85 CPG 2/13/85	5 5	NEC
36 MEMPHIS TN	W - BellSouth Mobility NW - Memphis Cellular Tel.	On line 5/1/85 CPG 2/13/85	5	Motorola AT&T
37 LOUISVILLE KY	W - BellSouth Mobility NW - Louisville Telephone	On line 1/3/85 On line 2/15/85	6 5	Motorola AT&T
38 PROVIDENCE RI	W - Nynex Mobile NW - Providence Cellular Tel.	On line 8/22/85 CPG 9/21/84	4 8	AT&T Motorola
39 SALT LAKE CITY UT	W - NewVector Communications NW - Salt Lake City Telephone	On line 1/29/85 CPG 3/6/85	6	AT&T
40 DAYTON OH	W - Ameritech Mobile NW - Cellular One	On line 5/31/85 On line 6/10/85	5	NTI/GE Ericsson
41 BIRMINGHAM AL	W - BellSouth Mobility NW - Birmingham Cellular Tel.	On line 8/26/85 CPG 2/14/85	3	Motorola
42 BRIDGEPORT CT	W - Southern New England Tel. NW - Bridgeport Cellular Co.	On line 5/20/85 CPG 1/28/85	5	AT&T Motorola
43 NORFOLK VA	W - Centel Cellular, Inc. NW - Cellular One	On line 5/3/85 On line 11/1/85	4 5	AT&T Motorola
44 ALBANY NY	W - Nynex Mobile NW - Cellular System One	On line 6/25/85 CPG 9/4/84	4	NTI/GE
45 OKLAHOMA CITY OK	W - Southwestern Bell Mobile NW - Cellular One	On line 1/14/85 On line 1/10/86	9	AT&T AT&T
46 NASHVILLE TN	W - BellSouth Mobility NW - Nashville Cellular Telephone	On line 6/10/85 CPG 1/30/85	8	Motorola
47 GREENSBORO NC	W - Centel NW - Cellular One	On line 5/15/85 On line 12/27/85	8 9	Motorola Motorola
48 TOLEDO OH	W - United TeleSpectrum NW - Toledo Cellular Telephone	On line 7/25/85 CPG 12/8/83	9 7	Motorola Ericsson
49 NEW HAVEN CT	W - Southern New England Tel. NW - New Haven Cellular Co.	On line 3/14/85 CPG 2/14/85	6	AT&T Motorola
50 HONOLULU HI	W - GTE Mobiline NW - Honolulu Cellular Tel.	CPG 3/26/84 CPG 2/27/85	4 13	Motorola Ericsson
51 JACKSONVILLE FL	W - BellSouth Mobility NW - Jacksonville Cellular Tel.	On line 6/12/85 CPG 2/21/85	6	Motorola
52 AKRON OH	W - GTE Mobiline NW - Cellular One	On line 10/31/85 CPG 2/13/85	4	Motorola NTI/GE
53 SYRACUSE NY	W - Nynex Mobile NW - Cellular One	On line 1/24/86 On line 12/31/85	3 3	NTI/GE Motorola
54 GARY IN	W - Ameritech Mobile NW - Gary Cellular Telephone	On line 3/11/85 CPG 1/30/85	3 2	AT&T Ericsson
55 WORCESTER MA	W - Nynex Mobile NW - Worcester Cellular Tel.	On line 11/18/85 On line 11/18/85	5	AT&T
56 NORTHEAST PENNSYLVANIA	W - Commonwealth Telephone NW - Northeast Pennsylvania Tel.	On line 7/2/85 On line 1/1/86	8 3	NTI/GE NTI/GE
57 TULSA OK	W - United States Cellular NW - Tulsa Cellular Telephone Co.	On line 8/30/85 CPG 6/18/85	8 10	NEC Astronet
58 ALLENTOWN PA	W - Bell Atlantic Mobile NW - Cellular One	On line 3/18/85 On line 10/18/85	5 5	AT&T NTI/GE
59 RICHMOND VA	W - Centel Cellular, Inc. NW - Cellular One	On line 5/10/85 CPG 2/4/85	5 7	AT&T NEC
60 ORLANDO FL	W - BellSouth Mobility NW - Orlando Cellular Tel.	On line 2/27/85 CPG 2/27/85	4	Motorola

\* - Includes Philadelphia, Allentown, PA, and Wilmington, DE.

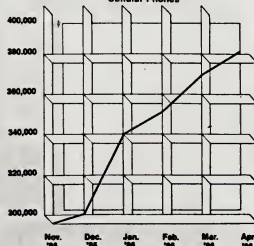
## The Procurement Stakes

Top 90 markets		
Manufacturer	Systems contracted for	Systems on line
Motorola	63	48
AT&T	51	44
NTI/GE	20	18
Ericsson	15	15
NEC	4	3
Astronet	3	1
CTVEF, Johnson	1	1

## New Markets

93	LAS VEGAS, NV
<p>W - Centel Status: On line 2/20/86 # of Cells: 5 Switching Equipment: Motorola NW - AMCELL</p>	

## Installed Base Cellular Phones



The information for the graph above is extrapolated from industry sources.



# Whatever Happened to Cellular Radio?

## Or, Why the Boom in the New Technology Fizzled

By THOMAS G. DONLAN

WASHINGTON — In the *Iliad*, Cassandra received the gift of accurate prophecy of impending harm, and the curse that her prophecies would never be believed. She warned the Trojans not to bring that horse inside the city.

Herschel Shosteck is something of a modern-day Cassandra. For most of the 'Eighties, he has been warning that cellular radio telephones are not quite the gold mine that most observers believe. When others, like Arthur Andersen & Co., predicted sales of seven million to 10 million new mobile telephones by 1990, Shosteck said 1.5 million.

The first cellular systems went on line in late 1983, and now almost all of the top 90 cities in the country have service. The distinctive corkscrew-shaped cellular radio antenna is pretty much standard equipment in the BMW-Mercedes-Cadillac set. When you see someone walking along a downtown street in urgent, animated conversation with an invisible antagonist, there's now a chance it's a portable phone user instead of a troubled streetperson.

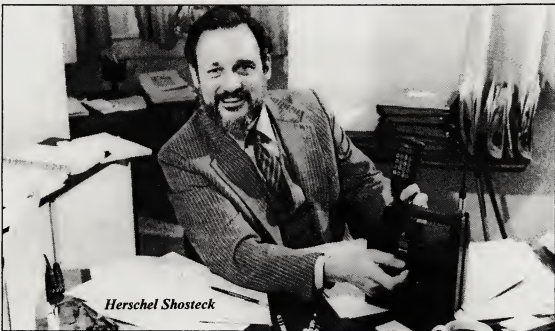
On Wall Street, investors can choose among at least two dozen companies with cellular properties, not counting the seven regional Bell holding companies, GTE and other telephone companies.

But Shosteck's forecasts have proved most accurate. Cellular telephones in service number just about 325,000, only about 10% higher than Shosteck's gloomiest projection for this point. And investors can look and look, but they will not find a company making a decent return on its investment in cellular telephones.

"There's some positive cash flow, but no real profits," comments Shosteck, who has just completed a survey of operating cellular systems in the 30 largest markets. The mail and phone inquiry was a form of "reality testing" for his theoretical estimates, he explains.

His conclusion: "There was no rainbow and there was no pot of gold at the end of it."

A sample of reported operating results reinforces the point: Southern New England Telephone says its cellular businesses won't reach break-even until next year; Ameritech says it doesn't know when it will make money in cellular; Alltel says it lost an unspecified amount in cellular in 1985 but considers it "attractive"; Cincinnati Bell says cellular cost it 20 cents a share in 1985; etc. Most of the smaller companies in the business lump their cellular results in with profits



Herschel Shosteck

from paging, broadcasting and other businesses.

Why is cellular lagging so far behind the promise of its most ardent advocates? Why doesn't every real-estate agent, every traveling salesman, every construction superintendent, everyone who spends a large piece of the work day in a car, have a cellular telephone? The answer simply is price.

Everyone who knows the business, even mean ol' Herschel Shosteck, believes cellular phones could be the video cassette recorders of the late 'Eighties if the price fell fast enough. Right now, however, the phones are like the Betamax in the mid-'Seventies, poised—seemingly permanently—on the brink of success.

The full cost of a typical cellular telephone—monthly financing, installation and service charges, has been cut nearly in half in two years, but it still runs more than \$150 a month in most cities. At that price, it's hard to overcome the sales resistance of people who use beepers and pay phones, or who just don't care that much about staying in touch with the office.

What's worse, Shosteck warns that much of the price decline is over. The price of equipment dropped dramatically last year because Japanese equipment producers listened to Shosteck's competitors in the consulting business and overestimated the size of the U.S. market. He reckons that early in 1985, a year's supply of mobile phones was sitting in warehouses.

Now, however, that supply

Continued on Page 29

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banks. In any case, you are paying nothing for a large bank. And it is impossible to really tell if they increased their reserves sufficiently and so on.

But talk about value! This is real value. And it is selling at a yield of 6%. It is about nine times last year's earnings, and maybe eight times this year's earnings. And the rather imperious chairman told us that it shouldn't grow at 19% a year as it has over the last 10-15 years. Now, that is anybody's guess. I just think, in terms of value and a big broad play on the market, it is hard to do much better.

**Q: Let's go back to your portfolio of 10 global stocks. How many of these would you put into it?**

**A:** The way I feel right now, I'm suffering from a little acrophobia in some of these other markets. Of 10 stocks, at this point, I would have four of them from Hong Kong. In a broader global portfolio, we would have 10%-12% of our assets in Hong Kong. I can't see any place that looks as attractive. The only thing that can go wrong is that if we are wrong about an economic recovery in the industrial world, Hong Kong is going to flop. It is an export economy, and has got to have the export demand.

The thing that I like best, though, is that I don't think there is a lot of risk in the Hong Kong market.

**Q: Anything else about your trip that struck you?**

**A:** I really was struck by the interrelationships of currencies. People really haven't focused on how these Southeast Asian currencies are linked to the dollar, that the decline in the dollar has really improved their competitive position.

An economy like Hong Kong's which was a net loser from high oil prices, really has a lot going for it here, with lower interest rates, lower oil prices, and a lower dollar. Southeast Asia is an exciting area. And it is clear to me that Singapore is not the way to play it right now. It may be later, but not now. Hong Kong is.

**Q: Singapore no, Hong Kong, yes.**

**A:** The thing about Singapore is—I guess I should say it—that the contrarians are attracted to it because the market is down. Just the fact that it is down in a worldwide bull market really has attracted contrarian buying—from very successful contrarians.

**Q: We might add that contrarians have been shorting our markets. So maybe this ain't the year for contrarians.**

**A:** That's right. I really want to make the case for Singapore, because you have to admire them as a people and for their system. But I can't do it.

**Q: Well, if you can't do it, we doubt the case can be made. Thanks, Burton.**

## Cellular Radio

Continued from Page 15

has been largely worked off. The Japanese producers have been hit with anti-dumping charges before the U.S. International Trade Commission. And the dollar buys 30% less in Japan than it did a year ago. So Shostek projects only moderate price declines for equipment over the next few years.

As for service, competition can be expected to drive charges

down, since the Federal Communications Commission mandated two competing systems in every city, one run by a local telephone company, one run by somebody else, usually a coalition of paging companies.

But Shostek notes that competition is likely to drive prices only to a level near actual costs, and he warns that big-city cellular systems are costing

more than anyone expected.

In a new survey of cellular systems, Shostek has discovered a disquieting trend: Cellular has not delivered the theoretical capacity expected, because customers aren't so obliging as to spread themselves out over a metropolitan area. Instead, they congregate in certain cells at certain hours of the day.

"Los Angeles has three freeways converging at a single point. Rush hour comes, and traffic stops. It's a great time to get on the phone." When users are concentrated like that, a system that could theoretically

handle 100,000 customers overloads at only a fifth of "capacity."

Just as bad, according to Shostek, are the problems of radio transmission in the concrete-and-steel canyons of the biggest cities. Echoes and signal bounces produce hot spots and dead spots. Such radio difficulties put a heavy load on a cellular system's central switch, which must transfer a conversation from cell to cell many more times than would be needed in a place with little interference.

The only solution is to add

Continued on Next Page



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## The Most Promising Markets

Market	Expected demand for Population cellular phones (thous.)			Market	Expected demand for Population cellular phones (thous.)		
	1985	1990			1985	1990	
New York	13,700	43,700	131,000	Cleveland-Akron	2,783	3,700	17,200
Los Angeles	11,615	51,900	154,000	Atlanta	2,393	5,400	24,200
Chicago	7,854	26,500	83,600	San Diego	2,085	4,800	21,200
Philadelphia	4,770	11,400	39,500	Denver	1,824	5,100	21,900
Detroit	4,718	10,000	34,900	Milwaukee	1,390	2,700	14,400
Boston	3,678	13,500	45,600	Tampa	1,837	800	7,300
San Francisco-San Jose	5,711	25,600	86,400	Cincinnati	1,541	2,100	9,600
Washington-Baltimore	5,189	19,700	65,600	Kansas City	1,473	3,700	14,800
Dallas	3,379	11,600	46,000	Buffalo	1,210	1,300	6,300
Houston	3,595	12,200	46,500	Phoenix	1,736	2,000	11,300
St. Louis	2,399	4,500	19,100	Indianapolis	1,199	1,700	8,000
Miami	2,898	6,200	26,500	New Orleans	1,338	1,100	6,500
Pittsburgh	2,377	2,100	11,400	Portland	1,349	1,900	9,600
Minneapolis	2,218	6,800	26,900				

The table provides Herschel Shostek's estimates of what demand existed for cellular phones last year in the top 30 markets and what it will be in 1990, based on wealth, number of businesses and population growth.

Cont. from Preceding Page  
averaging \$15 per resident of a big city market. But others are paying high prices, including Mobile Communications Corp. of America, Lin Broadcasting, the McCaw Communications subsidiary of Affiliated Publications, and, among telephone companies, BellSouth and Pacific Telesis.

For example, Mobile Communications Corp. of America, backed by BellSouth, agreed to buy 85% of American Cellular Telephone Corp. for a price that reflected about \$30 a head for access to residents of Los Angeles. The price may reflect MCCA's acquisition of a controlling interest in the Los An-

geles operation. Similarly, US-West has bid \$24 a head, plus \$5 more in anticipated construction costs, for a Communications Industries franchise in San Diego.

Lin Broadcasting found lower prices, which, however, would have seemed high two years ago. Lin added to its controlling interests in Dallas and Houston, recently by paying \$10 and \$13.75 a head, respectively. Lin lost \$4 million, or nearly 15 cents a share after tax, last year on cellular and is expected to lose more in 1986, in part because the costs of getting customers to use the service exceeded early revenues. But on the assumption that higher costs today mean higher earnings tomorrow, the market accords Lin a lofty multiple of 31 times earnings (which takes into account positive income from broadcasting).

Shostek is slow to knock such deals, since he does believe that cellular will someday be a fine and profitable business. "I wish I could sell out now; I wish I had something to sell out. It's not very often that you can get several thousand percent return in one or two years. However, that doesn't mean the people who are buying in now are fools. Over the long term—and I'm talking about 10 years—there will be a substantial profit, which makes a \$10-\$20 investment not unreasonable."

But Hershel Shostek has a reputation to uphold, so he adds: "A lot of them are in for disillusionment. Unless you have very deep pockets, you can't afford to be a part of it." ■

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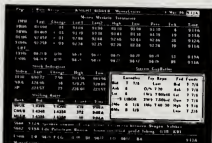
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## Gains in Quarterly Net At Tobacco Companies

Philip Morris Cos. said last week that first-quarter profits spurred 23% over a year ago, while R.J. Reynolds Industries Inc. posted a 13% gain in income.

The results reflect generally strong performances in the companies' food and tobacco businesses, as well as major acquisitions that they made last year.

Philip Morris said net income for the three months ended March 31 came to \$316 million, or \$1.32 a share, compared with \$256 million, or \$1.06 share. Revenues soared 78.7% to \$5.92 billion from \$3.31 billion.

Reynolds said its net income for the three months ended March 31 came to \$206 million, or 66 cents a share, compared with \$182 million, or 66 cents a share, a year ago.

Per-share earnings were unchanged because of dilution of 19 cents a share in the most recent quarter, a result of the company's acquisition of Nabisco Brands Inc. for \$4.9 billion in mid-1985.

Nabisco Brands' first-quarter results generally reflected strong performances in all of its major operating units.







FOR RELEASE Wednesday AM  
March 19, 1986

CONTACT: Bob Maher or  
Liz Maxfield (202) 785-0081

#### DRAMATIC INCREASE IN CELLULAR SUBSCRIBERS

WASHINGTON, D.C. -- The number of cellular telephone customers nearly tripled during 1985 according to the industry's trade association.

At the beginning of 1985 there were less than 100,000 subscribers to the new mobile communication service. The subscriber figure more than doubled during the first six months to 203,000 and then continued its dramatic climb to end the year with 340,213. This represents a 271 percent increase, the Cellular Telecommunications Industry Association ("CTIA") reported.

CTIA collects data from operating cellular systems every six months. This is the third survey. CTIA, which represents nearly 90 percent of all cellular operators, is the only source of such industry data. All but one of the 102 systems operating in 1985 are included in the survey. That system went on line the last week of the year and was inadvertently omitted from the data survey.

The dynamic expansion of the industry is also noted in the massive investment of capital (which increased 157 percent), the rise in service revenues and the addition of 69 new systems in 1985.

"We almost became a billion dollar industry," Robert W. Maher, Executive Director of CTIA, said in releasing the statistics. "Our capital investments totaled \$911,166,640. We began the year with \$354,760,500."

"It might be overstating the growth in our industry to call it 'phenomenal', but calling it 'dramatic' just seems too conservative," Maher said. "In reviewing industry analysts' projections for 1985, we find they range from a low of 175,000 customers to a high of 275,000. We felt that these would be conservative when we hit 203,000 by mid-year."

Maher said that documented figures on service revenues were not as specific as those in the subscriber and capital investment categories.

(more)

**Cellular Telecommunications Industry Association**

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"The service revenues are at a minimum of \$306,196,873," Maher said. "But three carriers either omitted the information or returned it in a form that could not be computed. In any case, it was up from \$178,084,808 at the beginning of the year, representing at least a 72 percent increase."

The number of cell sites increased from 346 to 913, reflecting both a growth in the existing subscriber base and the addition of new systems during the year.

The cellular industry, first licensed for commercial service in 1983, began the year with 33 systems in operation, although 90 cities had been licensed. Under the Federal Communications Commission mandate, two carriers are licensed to operate in each market.

The 102 operating systems are in 80 markets. Because the information is considered proprietary, statistics on individual cities are not available.

Maher said that much of the growth can be attributed to the additional systems which went on line, but that reports from systems operating prior to the beginning of 1985 have also shown strong growth.

"The value of cellular continues to be enhanced as additional cities come on line. It means that the subscriber can use his phone in a wider and wider environment. And each new city which receives cellular service will bring us closer to realizing our original promise of a truly national communications service," Maher said.

"We have seen dramatic progress in 1985. But I think 1986 will be equally as impressive for the industry," Maher said. "I think we will double the number of systems. And most of the top 10 cities which do not have two operators competing, should by the end of the year."

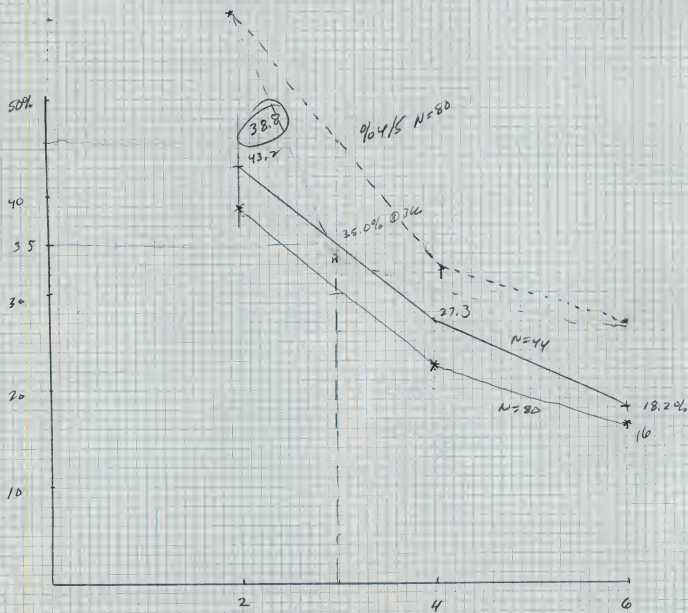


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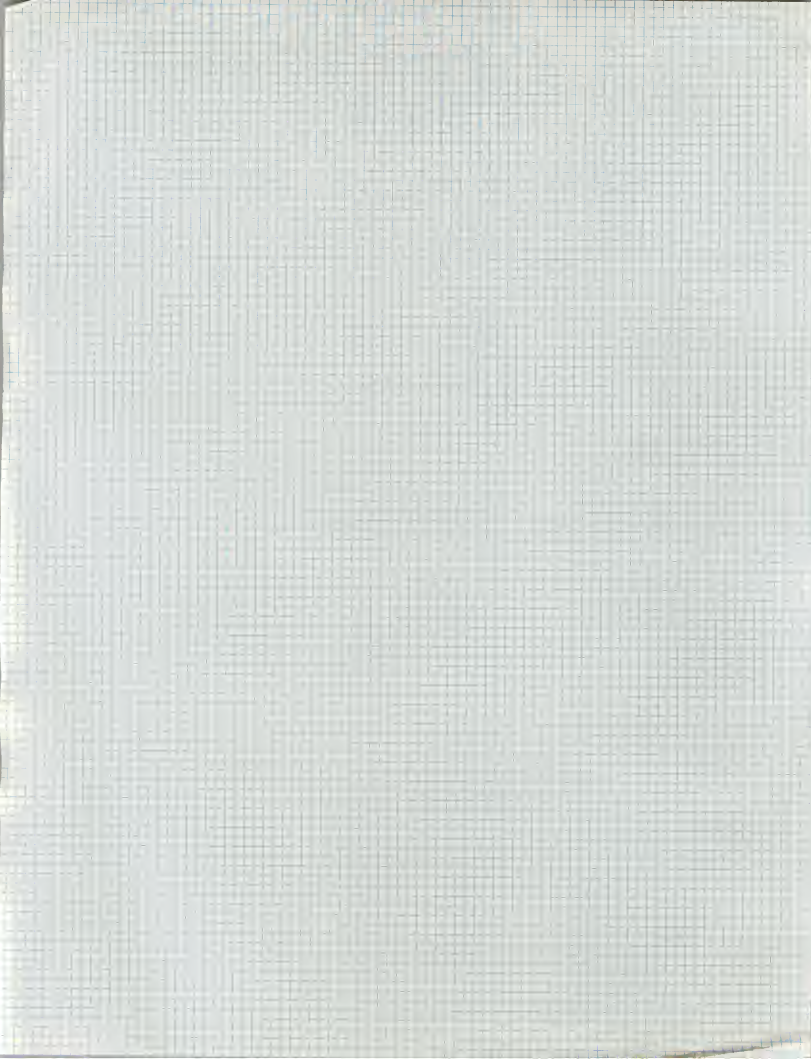
4/5 (A) 3 PRICE POINTS

N = 44

N = 20



6K = 27.5  
4K = 33.75  
2K = 58.75





## NY Court Kills FCC Strictures On Dial-A-Porn

By Leonard Heymann  
NEW YORK — A federal appeals court in New York has set aside FCC rules that would have restricted minors from gaining access to "dial-a-porn" message services, but did not prevent the commission from enacting the same regulations in other states.

The rules, requiring either a credit card or personal identification number (PIN) to access the adult-messages services, are unworkable in New York Telephone (Continued on Page 37)



JOINING TOGETHER: Charles Skibo, David Hann and Donald Prigmore, presidents of US Telecom, GTE Telenet and GTE Sprint, respectively, talk about how US Sprint will fly despite GTE's losses. Story on Page 4.

## IBM Links S/370, S/36 To Token Net; Enhances Software

By Laurel Nelson-Rowe  
RYE BROOK, N.Y. — IBM last week took the next major step in connectivity for its Token-Ring Network, bringing the System/370 mainframe and System/36 departmental minicomputer into the fold of systems that connect directly to the local-area network.

In the first flurry of Token-Ring Network follow-ons since the network's debut last year (Communications Week, Oct. 21, 1985), IBM also unveiled a second version of the Token-Ring Network PC Adapter, the add-in board that links PCs to the LAN, to support IBM Industrial Computers. Other hardware additions (Continued on Page 37)

## Brown Chairs Last Annual Meeting; No Successor Named

By Anna Zornosa  
SAN FRANCISCO — Charles L. Brown, 65, AT&T's chairman since 1979, swung the gavel for the last time at the 131st annual meeting last Tuesday, bidding farewell to the company's shareholders. He will retire in August.

Brown laid his comments to stockholders and the press with references to his accomplishments during his seven-year tenure. But he disappointed analysts who predicted he'd tip his hand about who will be named to succeed him.

Though Brown maintained his composure as he recounted his stewardship of the company during its pivotal years, his wife, Ann Lee Brown, had told employees that the departure was triggering deepfelt emotions.

Speaking after her husband at an employee meeting the night before, she

expressed how difficult the prospect of joining his last meeting was for Brown. She said he had chosen not to express his feelings to employees personally for fear he would cry, according to an AT&T employee present.

The Browns regard AT&T as their family and wish they did not have to leave in August, she said. Brown's parents worked for AT&T. His father worked for AT&T Long Lines for 37 years and his mother was a Long Lines operator supervisor. AT&T rules mandate retirement at the age of 65.

Brown looked haggard at the shareholders' meeting. His eyes bore heavy bags and his usual curt manner during press conferences was even more accentuated. One employee attributed his appearance and demeanor to (Continued on Page 6)

## Small Cellular Mkts. Get Hot

By Steven Titch  
In the nation's largest cities cellular telephones have become so commonplace that the image of a businessman wheeling through rush hour traffic with a phone in his hand no longer turns many heads.

But in smaller markets cellular remains a novelty, if it exists at all. That means new opportunities for system operators, for their customers—and for rubberneckers not yet conditioned to the sight of those one-handed drivers.

The smaller markets also represent new opportunities and challenges for transmission equipment vendors. Scaled-down systems for

smaller markets are the emerging trend in cellular radio telephone systems, as equipment vendors seek to satisfy the needs of cellular radio operators demanding economical networks they can bring on line quickly.

And that demand for smaller systems has provided a forum for start-up suppliers to challenge the leaders—Motorola Inc., AT&T, Northern Telecom Inc. and Ericsson Radio Systems Inc.—with economical, low-end cellular switching gear aimed at wireline (telco-owned) and non-wireline carriers. Robust competition and enhanced sales of stand-alone systems in (Continued on Page 21)

## Close Up Cellular Switching Systems

## PROFILE

### COS President A Real General



CommunicationsWeek Photo by Stan Scahill  
FAURE: COS's three-star general ready for the 'challenge.'

By Laurel Nelson-Rowe  
ALEXANDRIA, VA. — He's left behind the three-star epaulets, the spit-shined shoes and the tendency to salute instead of shaking hands, but other vestiges of a 35-year military career are still quite evident in Lincoln Faure, the new president of the Corporation for Open Systems.

Introduced as "the General," the retired Air Force officer has shaken his uniform for conservative suits and white shirts. But while the surface details have changed, Faure intends to use the discipline, tactics, diplomacy and management expertise he gained in decades of military assignments to help make COS an influential world force.

Harnessing the resources of COS' membership—upwards of 41 computer and communications equipment manu- (Continued on Page 36)

## Cellular Groups Jockey For Lottery Positions

By Steven Titch  
WASHINGTON — Three non-wireline cellular settlement groups last week were rushing to complete a merger agreement in time for this afternoon's FCC lottery for markets 121 to 135.

The maneuvers—bewildering as the IRS tax code, as much a gamble as a keno card—are in response to FCC rules that have undergone frequent and fundamental changes since the agency started awarding cellular permits several years ago.

Last week's frenzied activity reflected investor anxiety as thousands of cellular applicants competed for a handful of cellular permits. For many players, joining a settlement group seems the only hope of getting a piece of the action—tiny though the pieces may turn out to be.

Members of a settlement group agree that whichever one of them wins the lottery will sell slightly less than half its construction permit to the remaining group members. The FCC requires that the winner retain a majority interest.

According to David Bednarsh, president of Mobile (Continued on Page 36)

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## New Small Switch Vendors Heat Cellular Competition

(Continued from Page 1)  
small markets may be a consequence of these vendors' emergence.

Most wireline carriers have gotten off to substantial headstarts over their non-wireline competitors in the top 90 U.S. cellular markets, almost all of which have service. And mobile telephone switching offices (MTSOs) and their accompanying radio-frequency (RF) gear are either installed or on order in some smaller cities.

Likewise, many non-wirelines in the top 90 markets have already ordered their systems, even though some large non-wireline contracts in the top 30 are still up for grabs. Those awards will probably come later this year.

But in markets smaller than the top 90, the field is still virtually wide open for equipment vendors. Further, the geographic and economic considerations of the smaller markets provide a dimension of design flexibility not found in larger cellular markets.

Cellular operators have three options when building a system for smaller markets (*CommunicationsWeek*, March 24). If the city adjoins or is close to a larger one—the case with Reading, Pa. and Philadelphia—cell sites in the smaller city can be built to transmit, or “backhaul,” calling traffic to the high-capacity switch of the larger city via long-distance lines. That way there is no local switching intelligence; all calls are processed by the big-city switch.

A second option is a remote switching unit (RSU) in the smaller city, serving a large switch in the larger city. The RSU handles call-switching functions for the smaller city but leaves to the MTSO the major processing oper-

ations, such as collection of billing data, traffic analysis and diagnostics.

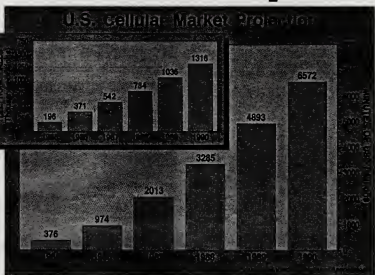
The third option is a self-contained, stand-alone system. Though the initial investment can be as high as \$5 million, prices appear to be declining. This option thus presents an increasingly attractive choice, especially for wirelines, in light of the rising costs for backhaul.

Bell companies have typically adopted one of the first two options and have made their largest city hubs for cellular operations. For instance, Ameritech Mobile Communications Inc., Schaumburg, Ill., operates a Flint, Mich., cellular network, using capacity from its Detroit system. Southwestern Bell Mobile Systems Inc., Dallas, operates San Antonio, Texas, from its MTSO in Dallas.

Almost all carriers begin with the first option, backhauling cellular traffic in small cities to the hub cities. Experts examining the often grim demand forecasts for the below-top-90 market generally predicted that backhauling would predominate indefinitely.

A Robert R. Nathan Associates Inc. report released earlier this year, for example, predicted that only 37 markets below the top 90 would be able to support two carriers. Nathan, a Washington-based analysis firm, said that to be viable those two carriers would have to backhaul calling traffic, because system procurement in such a case would be economically unfeasible (*CommunicationsWeek*, Feb. 24).

System engineers at Ameritech undoubtedly had this forecast as well as others in mind when it began service in Dayton, Ohio, by backhauling to a Northern Telecom switch in Colum-



bus. In only a few months, however, subscribership had mushroomed to more than 1,000, and long-distance costs mounted.

Ameritech was proceeding with plans to cut over a remote switch to handle the increasing traffic when Northern approached it with a counter offer: a scaled-down version of Northern's MTX switch, configured especially for smaller applications, at the same cost as the remote. Ameritech agreed and the new switch was placed in operation.

The MTX-M (M for Mini), was Richardson, Texas-based Northern's answer to what appears to be a serious assault by two smaller companies, CTI Inc., Corinth, Miss., and Quinton

Corp., Quincy, Ill. The established suppliers remain dominant. But CTI's and Quinton's scaled-down equipment, often requiring an initial investment of less than \$1 million, is shaping up as a threat in the small-systems market—a market which, according to analysts, did not exist six months ago.

For example, NewVector Communications Inc., a subsidiary of U S West Inc. but operating as a non-wireline in Omaha, Neb., has just selected a CTI switch, which uses E.F. Johnson radio and base-station equipment. NewVector also just recently cut over a Quinton system it had been testing in

(Continued on Page 22)

## Motorola Leads Small Pack Of Cellular System Makers

By Steven Titch

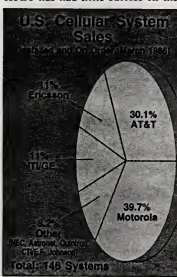
Call Motorola Inc. the leader of the cellular vendors pack. Primarily because it has the widest array of equipment and a solid record in mobile communications systems, Motorola has won the largest number of contracts—58, with 38 of those in operation by the end of March.

Motorola has been particularly strong among non-wirelines, where key contracts include Cellular Telephone Co., New York; Cellular One, Washington; and Gencom Cellular Inc., Atlanta. Motorola is also principle supplier to GTE Mobitel Inc., Houston; United TeleSpectrum Inc., the cellular arm of Kansas City-based United Telecommunications Inc.; and Centel Cellular Inc., Chicago.

In addition, Motorola has sold small systems to BellSouth Mobility Inc., Atlanta; Vynex Mobile Communications Inc., Pearl River, N.Y.; and Southwestern Bell Mobile Systems Inc., Dallas. Even so, its overall penetration of the Bell market has been minimal.

Doing the busiest Bell business is

AT&T, which has clinched 44 contracts and brought 38 systems on line. Most of those have been Bell; AT&T has had little success on the



non-wireline side. Its one major non-wireline contract, for three systems with McCaw Cellular Communications Inc., Bellevue, Wash., may provide a windfall. McCaw bought MCI Airsigna's cellular holdings and now controls several more markets in the top 30 in which contracts are still to be awarded.

AT&T's primary competitor for wireline business is Northern Telecom Inc., Richardson, Texas. Northern has teamed its switch with General Electric Co.'s cellular radio frequency (RF) gear to provide a turnkey system. Northern is primary vendor to NewVector Communications Inc., a U S West subsidiary, and has made inroads with the other BOCs. So far it has 16 contracts with 14 systems in operation.

Ericsson Radio Systems Inc. has major non-wireline pacts with the Cellular One companies in Chicago, Detroit, San Francisco and Buffalo. Radio Systems is a unit of Ericsson Inc., the U.S. subsidiary of LM Ericsson Telephone Co., Sweden, the worldwide leader in cellular system sales.

Ericsson's presence in those Cellular One cities has enabled it to scoop up non-wireline business in the surrounding areas for a total of 16 contracts. Delays on the non-wireline side, however, have resulted in cutover of only three Ericsson systems.

Astron Corp., Lake Mary, Fla., a joint venture of Stromberg-Carlson Corp. and Japan's Mitsubishi Electric Corp., was plagued by a slow start and has only made three sales. NEC America Inc.'s Switching Systems Division, Richardson, whose Japanese parent supplied Nippon Telegraph & Telephone Public Corp. with the world's first cellular system, has four U.S. contracts.

Start-ups Quinton Corp., Quincy, Ill., and CTI Inc., Corinth, Miss., have sold one system each.

In the also-ran category comes Harris Corp.'s RF Communications Sector, Rochester, N.Y., which sold three systems before bowing out of the switching market late last year. Another casualty was ITT Network Systems, Raleigh, N.C., which failed to sell any cellular MTSOs.



# Smaller Cellular Markets Represent New Challenges,

(Continued from Page 21)  
Albuquerque, N.M.

Non-wirelines are generally considered more cost-conscious than their richer telco counterparts. But what's often forgotten is that though one Bell company may operate several systems, each operation is a separate partnership entity accountable to diverse owners. NewVector may operate Seattle and Omaha, for instance, but one cannot subsidize the other.

So cost is an important consideration, even for a telco, said Jerry Wolfer, NewVector's director of operations. "We do whatever makes economic sense," Wolfer said.

"Our attitude is to go in as cheaply as possible," said Tom O'Malley, assistant vice president of system development at Southwestern Bell Mobile Systems. This involves studying construction costs, real estate acquisition and backhaul costs, which, if not figured properly, "can kill you," O'Malley said.

Though Southwestern Bell has thus far procured its cellular gear from AT&T Network Systems, Morristown, N.J., and Motorola, Schaumburg, the company will be considering bids from a new list of suppliers—including Quintron—for systems in Southwestern's smaller markets, O'Malley said.

Kevin Colosia, marketing manager for cellular system products at Motorola's Systems Division, sees two segments in the wireline market. "There are the larger independents that are spread across the country and then there are the BOCs, which have a strong regional presence," Colosia said. "I anticipate the regional companies will try to maximize their franchised areas."

Motorola is addressing the entire cellular market, from its EMX-2500 high-capacity digital MTSO down to its recently-introduced EMX II, whose capacity is limited to four cells and 54 voice channels. This switch, however, will not be available until 1987, placing Motorola at a competitive disadvantage. Motorola's EMX-2500 is a cellular version of the DEX600 tandem switch manufactured and supplied to Motorola by Digital Switch Corp., Plano, Texas.

Motorola maintains an advantage, however, with its installed base of MTSOs and, of late, its ability to network its switches. This capability, known as Distributed Mobile Exchange (DMX), provides automatic transfer of data between Motorola switches. Thus cellular subscribers on a Motorola system are able to retain features such as call forwarding and three-way calling when traveling in other cities where the cellular system employs Motorola MTSOs.

DMX will ultimately lead to switch-to-switch "handoffs," in which a moving caller can drive out of one market and into another without interrupting the call. DMX has been implemented already in Motorola's U.K. system and Colosia predicts it will be used in the United States very soon. "We see a heavy presence in the Northeast cor-

ridor," he said.

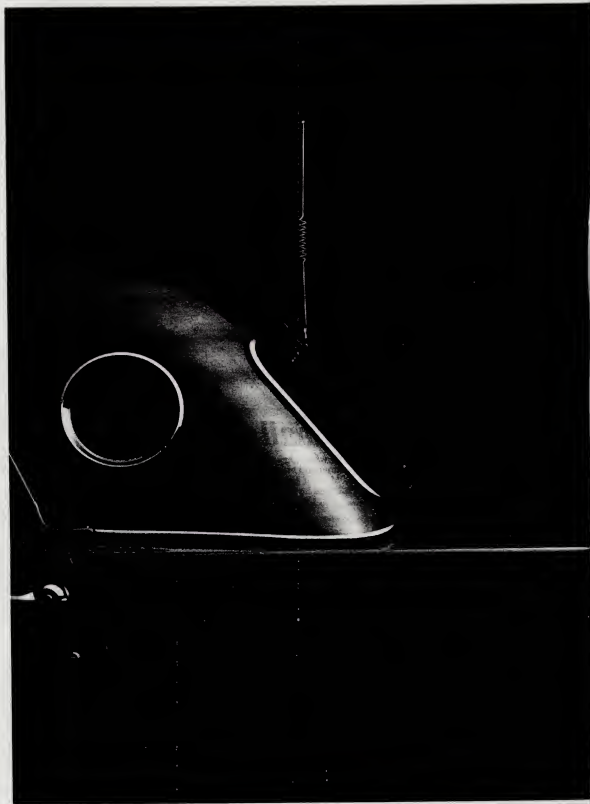
Northern Telecom expects to have switch-to-switch handoff capability available by August, according to Leonard McCoy, senior account manager for cellular mobile telephone service. "We expect this to be a strong factor with the 90-plus markets," McCoy said. Northern's method also provides operators with call-traf-

fic tracking and breakdown on a cell-by-cell basis, enabling operators to note patterns in usage and project capability requirements.

Still, the size of Northern's MTX-M, with a minimum of 96 ports, may be too large to compete effectively with smaller and less expensive gear.

AT&T, with only two models—the Autoplex 10 and the

Autoplex 100—gives every indication it will not be pursuing the small system market, choosing instead to work with its BOC customers at expanding existing systems to cover wider areas. Examples include Bell Atlantic Mobile Systems' so-called Supersystem, linking Autoplexes in Philadelphia, Wilmington, Del., and Atlantic City, N.J.





# New Opportunities For System Equipment Vendors

At a recent trade show, Cynthia Zey, department chief for cellular systems at AT&T Network Systems, said the company would adopt this expansion policy throughout the smaller MSAs. Zey was unavailable for this report, but Sophia Petrow, product planner for AT&T Network Systems, said AT&T has not made a final decision concern-

ing marketing or product plans in the small markets.

Petrow did say that AT&T plans to make Autoplex-to-Autoplex handoff capability available later this year.

## Seeking Standards

The Electronic Industries Association has been unable so far to arrive at standards that would allow handoffs

among competing manufacturers' switches.

Most suppliers remain reluctant to share proprietary information, despite having submitted engineering proposals. Optimists see a protocol emerging by the end of this year; pessimists don't expect real progress much before 1987 or 1988. The one thing both sides agree about is that

a universal protocol must be developed for cellular to become a truly nationwide mobile communications network.

Ericsson has switch-to-switch networking in the engineering phase but no specific availability date, said Harry Kratz, Ericsson's director of operations. Like AT&T, Ericsson has no specialized standalone equipment aimed at op-

erators in small markets. Its main strategy is based on backhaul alternatives.

Using a major contract in Detroit as an anchor, for example, Ericsson is now building systems for non-wirelines in Lansing, Mich., and Toledo, Dayton and Columbus, Ohio. All will share Detroit's switch. Observers believe the company will follow this format in the smaller markets around San Francisco, Chicago and Houston, where Ericsson has also won non-wireline contracts.

One cost advantage that Ericsson is exploiting is the non-wirelines' ability to construct and operate their own long-haul lines. The BOCs are prevented by the AT&T divestiture agreement from providing service across LATA (local access transport area) boundaries. Those restrictions, however, probably won't last forever. Several Bell companies already have waiver requests pending before U.S. district judge Harold H. Greene on this matter. The BOCs argue that, for cellular, the inter-LATA restriction is competitively injurious.

Smaller suppliers Quintron and CTI agree with other vendors that cost is a major priority among carriers. Yet, unlike Ericsson and AT&T, they believe operators also seek the greater degree of control that a stand-alone switch affords.

"The technological advantage of a stand-alone switch is serviceability without dependency," said Glen Teason, cellular sales manager for Quintron.

Both Quintron and CTI use the modular concept—building up a smaller system, instead of borrowing down from a larger one. Both companies can offer starter systems of two or three cells for under \$1 million.

Jim Davis, senior staff engineer for cellular hardware at CTI, scoffs at the notion that cellular will not make it to the small markets. "I think all wirelines will put a system online," he said. "At some point, even in the small markets, that [radio] spectrum will be a valuable commodity."

Quintron's Teason is equally upbeat. "Our system is economical due to its modularity," he said. "We customize hardware and software for unique applications. Each type of carrier has its special needs. We try to hit their 'hot button.'"

In addition to its stand-alone switch, Quintron offers operators a variety of alternatives, including cell sites with compact, often pole-mounted equipment especially economical for highway corridors, Teason said.

Both companies are vigorously marketing to wirelines and non-wirelines, which they see as having similar needs, albeit different ways of doing business.

In 1957 Ed Sullivan, Elvis and Eisenhower were on everybody's mind. And cellular communication was only a passing thought.

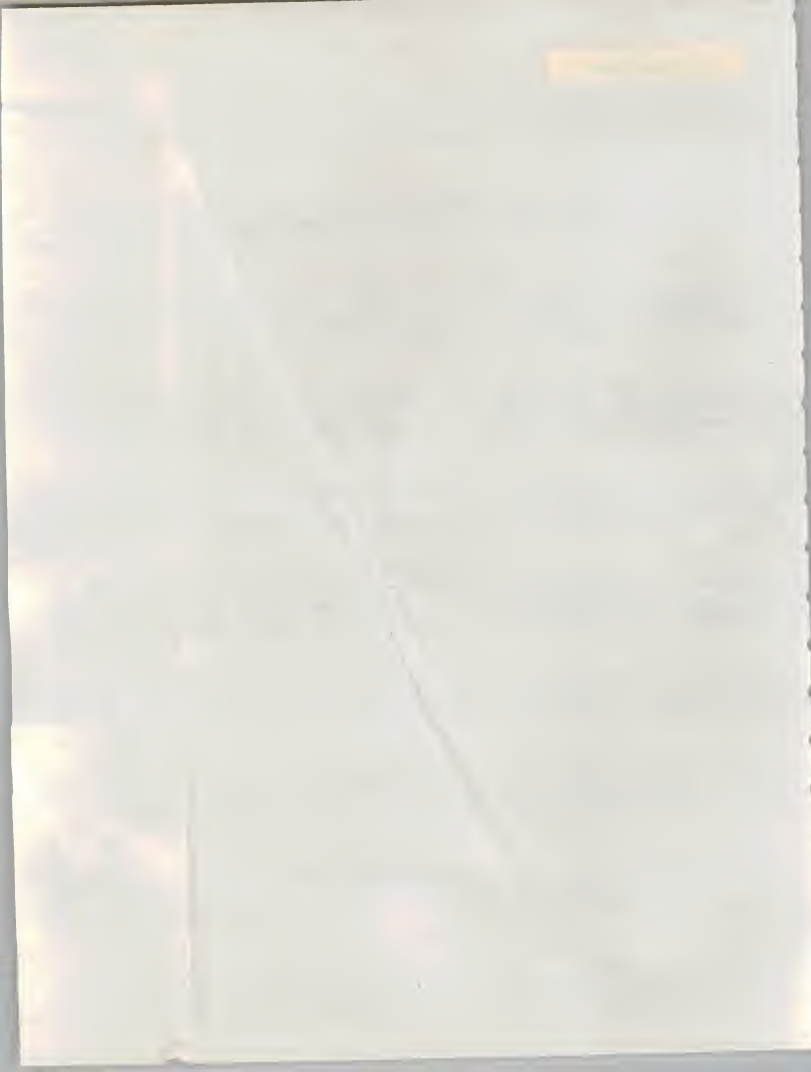
Today however, we offer the technology to take your cellular operations into 2057. And beyond.

ERICSSON 



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7	CITY	POP	PHONES 85	PEN 85	PHONES 90	PEN 90
8	NEW YORK	13700	43700	0.319	131000	0.956
9	LOS ANGELES	11615	51900	0.447	154000	1.386
10	CHICAGO	7854	26500	0.337	83600	1.064
11	PHILADELPHIA	4770	11400	0.239	39500	0.826
12	DETROIT	4718	10000	0.212	34900	0.740
13	BOSTON	3678	13500	0.367	45600	1.240
14	SAN FRANCISCO-SAN JOSE	5711	25600	0.448	86400	1.513
15	WASHINGTON-BALTIMORE	5189	19700	0.380	65600	1.264
16	DALLAS	3379	11600	0.343	46000	1.361
17	HOUSTON	3595	12200	0.339	46500	1.293
18	ST. LOUIS	2399	4500	0.188	19100	0.796
19	MIAMI	2896	6200	0.214	26500	0.914
20	PITTSBURGH	2377	2100	0.088	11400	0.480
21	MINNEAPOLIS	2218	6800	0.307	26900	1.213
22	CLEVELAND-AKRON	2783	3700	0.133	17200	0.618
23	ATLANTA	2393	5400	0.226	24200	1.011
24	SAN DIEGO	2085	4800	0.230	21200	1.017
25	DENVER	1824	5100	0.260	21900	1.201
26	MILWAUKEE	1390	2700	0.194	11400	0.820
27	TAMPA	1837	800	0.044	7300	0.397
28	CINCINNATI	1541	2100	0.136	9600	0.623
29	KANSAS CITY	1473	3700	0.251	14800	1.005
30	BUFFALO	1210	1300	0.107	6300	0.521
31	PHOENIX	1736	2000	0.115	11300	0.651
32	INDIANAPOLIS	1199	1700	0.142	8000	0.667
33	NEW ORLEANS	1338	1100	0.082	6500	0.466
34	PORTLAND	1349	1900	0.141	9600	0.712
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37	TOTAL	96259	262000	0.293	986300	1.025
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23-May-86

PUBLIC FORECAST OF TOP 30 MARKETS  
CELLULAR TELEPHONE GROWTH  
ANNUAL 1985 & 1990

CITY	POP	PHONES 85	PEN 85	PHONES 90	PEN 90	% CHANGE
NEW YORK	13780	43700	0.319	131000	0.956	199.8
LOS ANGELES	11615	51900	0.447	154000	1.326	196.7
CHICAGO	7854	25500	0.337	83600	1.054	215.5
PHILADELPHIA	4778	11400	0.239	39500	0.828	246.5
DETROIT	4718	10300	0.212	34300	0.740	249.0
BOSTON	3676	13500	0.367	45600	1.240	237.8
SAN FRANCISCO-SAN JOSE	5711	25600	0.448	86400	1.513	237.5
WASHINGTON-BALTIMORE	5189	19700	0.380	65600	1.264	233.0
DALLAS	3373	11500	0.243	46000	1.361	226.6
HOUSTON	3595	12300	0.339	46500	1.293	261.1
ST. LOUIS	2395	4500	0.168	19100	0.736	324.4
MIAMI	2896	6200	0.214	26500	0.914	327.4
PITTSBURGH	2377	2100	0.088	11400	0.480	442.9
MINNEAPOLIS	2218	6800	0.307	26900	1.213	225.6
CLEVELAND-AYRON	2763	3700	0.133	17200	0.618	354.9
ATLANTA	2393	5400	0.226	24200	1.011	346.1
SAN DIEGO	2085	4900	0.230	21200	1.017	341.7
DENVER	1804	5100	0.280	21900	1.201	329.4
MILWAUKEE	1390	2700	0.194	11400	0.820	322.2
TAMPA	1837	600	0.044	7300	0.297	612.5
CINCINNATI	1541	2100	0.136	9600	0.623	357.1
KANSAS CITY	1473	3700	0.251	14900	1.025	302.8
BUFFALO	1218	1300	0.107	6300	0.521	284.6
PHOENIX	1736	2000	0.115	11300	0.651	465.0
INDIANAPOLIS	1199	1700	0.142	8000	0.667	370.6
NEW ORLEANS	1338	1100	0.082	6500	0.486	490.9
PORTLAND	1349	1900	0.141	9600	0.712	405.2
TOTAL	96259	262000	0.253	966300	1.025	249.8

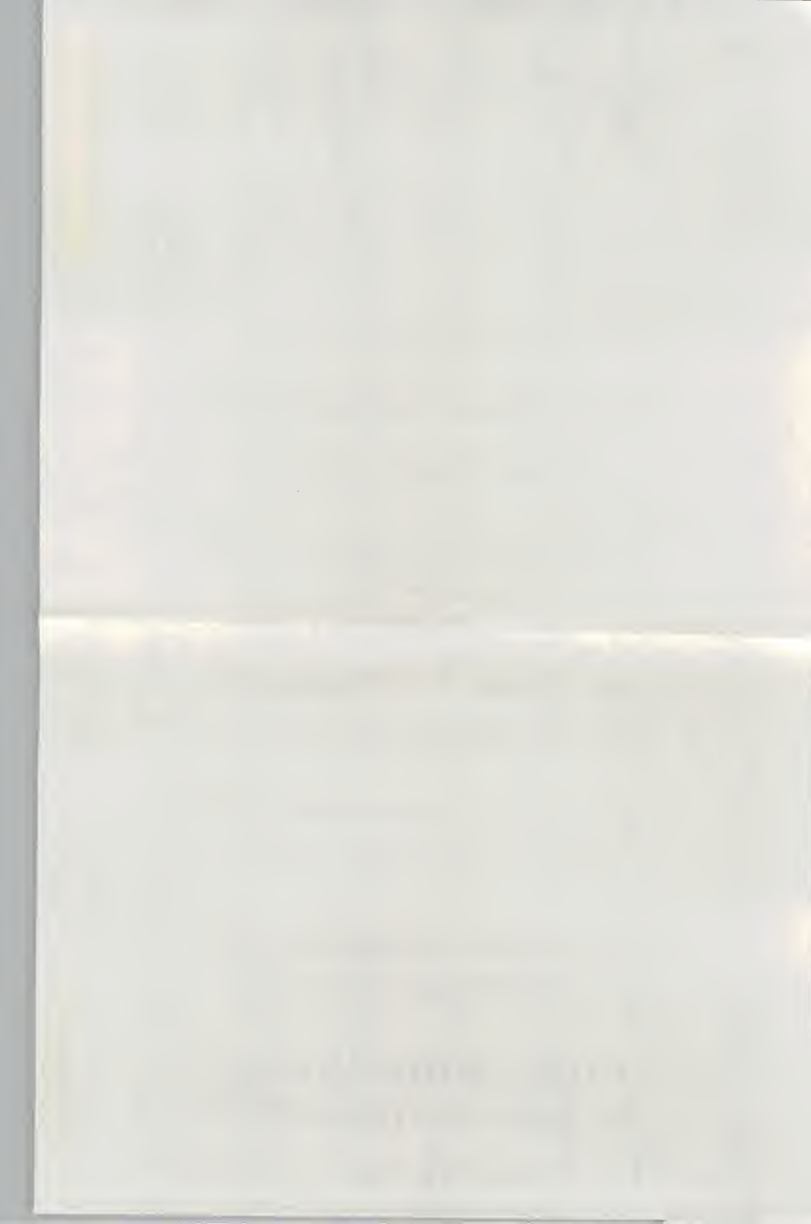
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		POPULATION												X CHANGE	
	CITY	(thous.)	PHONES 85	PEN 85	PHONES 86	PEN 86	PHONES 87	PEN 87	PHONES 88	PEN 88	PHONES 89	PEN 89	PHONES 90	PEN 90	1985-90
10															
11	NEW YORK	13700	43700	0.319	56166	0.410	72239	0.527	92878	0.678	119415	0.872	131000	0.956	199.8
12															
13	LOS ANGELES	11615	51900	0.447	66729	0.575	85794	0.739	110306	0.950	141823	1.221	154000	1.326	196.7
14	CHICAGO	7854	26500	0.337	34271	0.434	43806	0.558	56322	0.717	72414	0.922	83600	1.064	215.5
15	PHILADELPHIA	4770	11400	0.239	14657	0.307	18845	0.395	24229	0.506	31152	0.653	39500	0.828	246.5
16															
17	DETROIT	4718	10000	0.212	12857	0.273	16531	0.350	21254	0.450	27326	0.579	34900	0.740	249.0
18	BOSTON	3678	13500	0.367	17357	0.472	22316	0.607	28592	0.780	36890	1.003	45600	1.240	237.8
19															
20	SAN FRANCISCO-SAN JOSE	5711	25600	0.448	32914	0.576	42318	0.741	54409	0.953	69955	1.225	86400	1.513	237.5
21															
22	WASHINGTON-BALTIMORE	5189	19700	0.380	25329	0.488	32565	0.628	41870	0.807	53832	1.037	65600	1.264	233.0
23	DALLAS	3379	11500	0.343	14914	0.441	19176	0.567	24654	0.730	31698	0.938	46000	1.361	296.6
24															
25	HOUSTON	3595	12200	0.339	15686	0.436	20167	0.561	25929	0.721	33338	0.927	46500	1.293	281.1
26															
27	ST. LOUIS	2399	4500	0.188	5786	0.241	7439	0.310	9564	0.399	12297	0.513	19100	0.796	324.4
28	MIAMI	2898	6200	0.214	7971	0.275	10249	0.354	13177	0.455	16942	0.585	26500	0.914	327.4
29															
30	PITTSBURGH	2377	2100	0.088	2700	0.114	3471	0.146	4463	0.188	5738	0.241	11400	0.480	442.9
31															
32	MINNEAPOLIS	2218	6800	0.307	8743	0.394	11241	0.507	14452	0.652	18582	0.838	25900	1.213	295.6
33															
34	CLEVELAND-AKRON	2783	3700	0.133	4757	0.171	6116	0.220	7864	0.283	10111	0.363	17200	0.618	364.9
35	ATLANTA	2393	5400	0.226	6943	0.290	8927	0.373	11477	0.480	14756	0.617	24200	1.011	348.1
36															
37	SAN DIEGO	2085	4800	0.238	6171	0.296	7935	0.381	10202	0.489	13117	0.629	21200	1.017	341.7
38															
39	DENVER	1824	5100	0.280	6567	0.359	8431	0.462	10839	0.594	13936	0.764	21900	1.201	329.4
40															
41	MILWAUKEE	1390	2700	0.194	3471	0.250	4463	0.321	5738	0.413	7378	0.531	11400	0.820	322.2
42															
43	TAMPA	1837	800	0.044	1029	0.056	1322	0.072	1700	0.093	2186	0.119	7300	0.397	812.5
44															
45	CINCINNATI	1541	2100	0.136	2700	0.175	3471	0.225	4463	0.290	5738	0.372	9600	0.623	357.1
46	KANSAS CITY	1473	3700	0.251	4757	0.323	6116	0.415	7864	0.534	10111	0.686	14800	1.005	380.0
47															
48	BUFFALO	1210	1300	0.107	1671	0.138	2149	0.176	2763	0.228	3552	0.294	6300	0.521	384.6
49	PHOENIX	1736	2000	0.115	2571	0.148	3306	0.190	4251	0.245	5465	0.315	11300	0.651	465.0
50															
51	INDIANAPOLIS	1199	1700	0.142	2186	0.182	2810	0.234	3613	0.301	4645	0.387	8000	0.667	378.6
52															
53	NEW ORLEANS	1338	1100	0.082	1414	0.106	1818	0.136	2338	0.175	3006	0.225	5500	0.485	498.9
54															
55	PORTLAND	1349	1900	0.141	2443	0.181	3141	0.233	4038	0.299	5192	0.385	9600	0.712	405.3
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